

Engineering
Library

620.62

AS1

C26

JAN 26 1917
UNIV. OF MICH.
LIBRARY

PROCEEDINGS
OF THE
AMERICAN SOCIETY
OF
CIVIL ENGINEERS

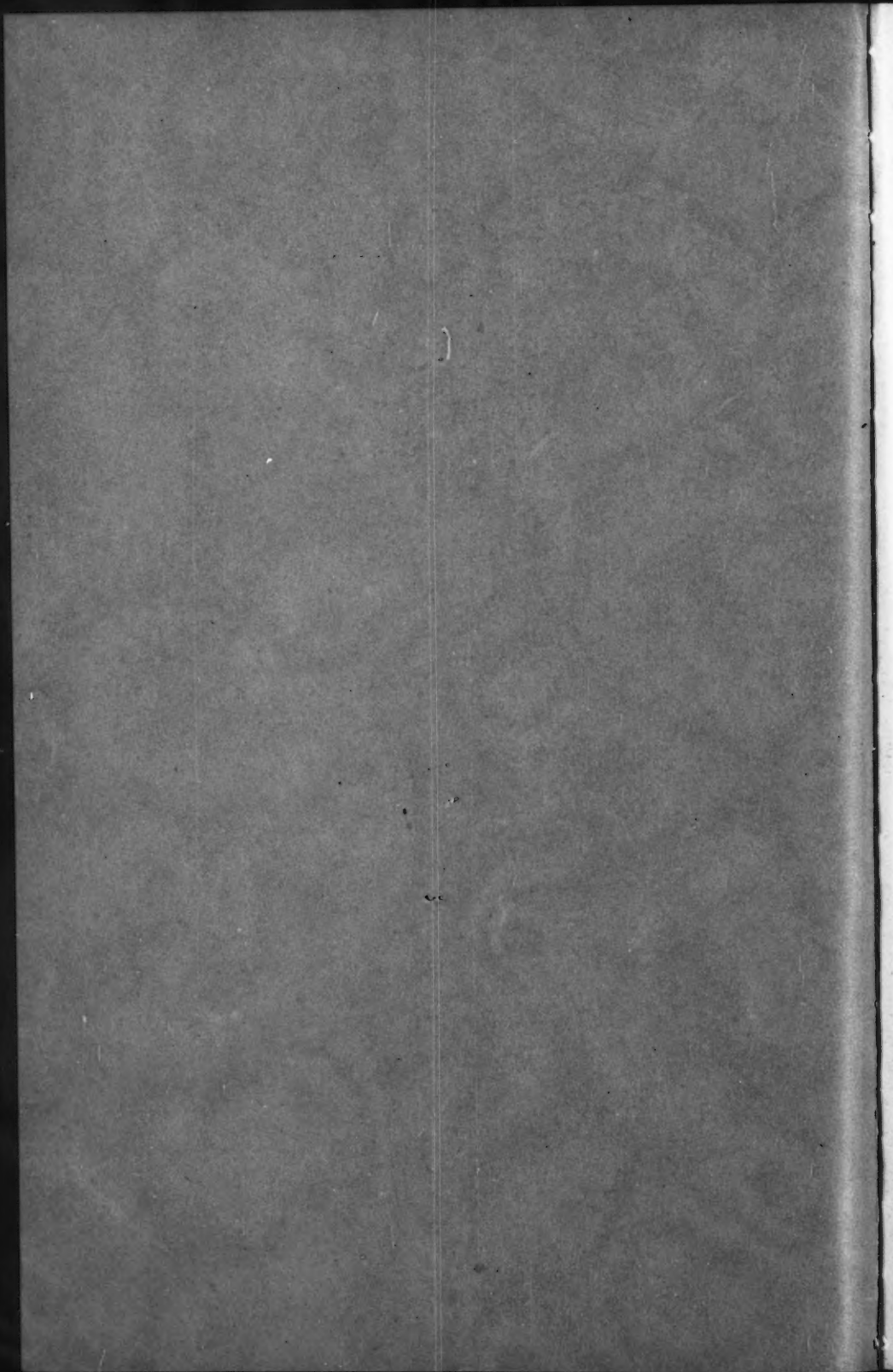
VOL. XLIII—No. 1



January, 1917

Published at the House of the Society, 220 West Fifty-seventh Street, New York,
the Fourth Wednesday of each Month, except June and July.

Copyrighted 1917, by the American Society of Civil Engineers.
Entered as Second-Class Matter at the New York City Post Office, December 15th, 1896.
Subscription, \$8 per annum.



AMERICAN SOCIETY OF CIVIL ENGINEERS

INSTITUTED 1852

PROCEEDINGS

This Society is not responsible for any statement made or opinion expressed in its publications.

SOCIETY AFFAIRS

CONTENTS

	PAGE
Minutes of Meetings:	
Of the Society, December 20th, 1916, and January 3d, 1917.....	1
Society Items of Interest.....	3
Announcements:	
Hours during which the Society House is open.....	5
Future Meetings.....	5
Searches in the Library.....	5
Papers and Discussions.....	5
Local Associations of Members of the American Society of Civil Engineers.....	6
Privileges of Engineering Societies Extended to Members.....	10
Annual Reports:	
Of the Board of Direction.....	13
Of the Secretary.....	20
Of the Treasurer.....	23
Accessions to the Library:	
Donations.....	24
Membership (Additions, Resignations, Deaths).....	27
Recent Engineering Articles of Interest.....	34

MINUTES OF MEETINGS

OF THE SOCIETY

December 20th, 1916.—The meeting was called to order at 8.30 P. M.; T. Kennard Thomson, M. Am. Soc. C. E., in the chair; T. J. McMinn, Assistant Secretary, acting as Secretary; and present, also, 90 members and 12 guests.

A paper by L. P. Jerrard, Jun. Am. Soc. C. E., entitled "The Valuation of Land", was presented by the Assistant Secretary, and discussed by Messrs. Hugh A. Kelly, Edward S. Rankin, W. J. Boucher, J. S. Walker, and Franklin F. Mayo. A communication on the subject from W. I. King, Esq., was presented by the Assistant Secretary.

The Assistant Secretary presented a letter from The American Museum of Safety inviting the members of the Society to visit its collection of exhibits of industrial and general safety appliances at 18 West 24th Street, New York City.

The Assistant Secretary announced the following deaths:

EDWARD MANNING BIGELOW, of Pittsburgh, Pa., elected Member, December 4th, 1889; died December 6th, 1916.

DANIEL MCCOOL, of Grand Rapids, Mich., elected Member, September 5th, 1883; died December 1st, 1916.

HAROLD PARKER, of New York City, elected Member, June 7th, 1899; died November 29th, 1916.

JOSEPH RAMSEY, of Lorain, Ohio, elected Member, May 1st, 1889; died July 7th, 1916.

GRANT ROHRER, of New York City, elected Member, July 1st, 1909; died December 12th, 1916.

EDMUND BROWNELL WESTON, of Providence, R. I., elected Member, December 6th, 1882; died December 9th, 1916.

WILLIAM FREDERICK ALFRED ANSON, of Lebanon, Va., elected Associate Member, October 1st, 1912; died July 17th, 1916.

GEORGE EDWARD VANSITTART, of France, elected Associate Member, March 5th, 1912; died May 14th, 1916.

ROGER TAPPAN, of London, England, elected Junior, December 3d, 1884; died December 6th, 1916.

Adjourned.

January 3d, 1917.—The meeting was called to order at 8.30 P. M.; Director George W. Fuller in the chair; Chas. Warren Hunt, Secretary; and present, also, 94 members and 13 guests.

The minutes of the meetings of November 15th and December 6th, 1916, were approved as printed in *Proceedings* for December, 1916.

A paper by R. E. Bakenhus, M. Am. Soc. C. E., entitled "Tests of Concrete Specimens in Sea Water, at Boston Navy Yard", was presented by the Secretary, and the subject was discussed by Messrs. T. Kennard Thomson, J. J. Yates, George W. Fuller, J. R. McClintock, S. B. Williamson, W. C. Briggs, C. S. Bilyeu, W. E. Day, Marshall W. Brown, W. F. Smith, and Robert Ridgway.

The Secretary announced the following deaths:

ISAAC WAYNE VON LEER, of Philadelphia, Pa., elected Member, May 3d, 1899; died November 23d, 1916.

DAVID MILLER WHITE, of El Paso, Tex., elected Associate Member, November 8th, 1909; died October 29th, 1916.

Adjourned.

SOCIETY ITEMS OF INTEREST

The Award of the John Fritz Medal for 1916.

The John Fritz Medal for 1916, awarded to Professor Elihu Thomson for his achievements in electrical invention, electrical engineering, industrial development, and scientific research, was presented at a meeting of the American Institute of Electrical Engineers, held on December 8th, 1916, at Central Hall, Massachusetts Institute of Technology, Boston, Mass.

Professor Albert Sauveur, Chairman of the John Fritz Medal Board of Award, presided. Mr. John J. Carty, Chairman of the Presentation Committee, gave briefly the history of the establishment of the medal, as follows:

The John Fritz Medal was established by the professional associates and friends of John Fritz, of Bethlehem, Pa., on August 21st, 1902, his eightieth birthday, to perpetuate the memory of his great achievements in industrial progress. The medal may be awarded annually, but not oftener, and is for notable scientific or industrial achievement. The medal is of gold, and is accompanied by an engraved certificate. It is awarded by a Board of sixteen, appointed or chosen in equal numbers from the membership of the four National Engineering Societies: The American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. The members of the Board at present are: Charles Warren Hunt, John A. Ockerson, George F. Swain, Charles D. Marx, E. Gybbon Spilsbury, Charles F. Rand, Christopher R. Corning, Albert Sauveur, John R. Freeman, Ambrose Swasey, John A. Brashear, Frederick R. Hutton, Ralph D. Mershon, C. O. Mailloux, Paul M. Lincoln, and John J. Carty.

The first impression from the artist's design was given to Mr. Fritz, himself, at a dinner given in his honor in 1902. Those who received the medal subsequently were: Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas Alva Edison, Charles T. Porter, Alfred Noble, Sir William Henry White, Robert Woolston Hunt, John Edson Sweet, and James Douglas.

The next speaker, E. W. Rice, Jr., President of the General Electric Company, gave an extended description of Dr. Elihu Thomson's many achievements in electrical invention, electrical engineering, industrial development, and scientific research.

Dr. Richard C. Maclaurin, President of the Massachusetts Institute of Technology, then addressed the meeting, and paid a tribute of respect to Dr. Thomson.

The medal was then presented to Dr. Thomson by Dr. Charles Warren Hunt, who was Chairman of the Board at the time the award was made.

Dr. Thomson, in accepting the medal, expressed his deep sense of appreciation of the honor conferred on him, and his thanks.

The meeting then adjourned.

ANNOUNCEMENTS

The House of the Society is open from 9 A. M. to 10 P. M., every day, except Sundays, Fourth of July, Thanksgiving Day, and Christmas Day.

FUTURE MEETINGS

February 7th, 1917.—8.30 P. M.—This will be a regular business meeting. A paper by A. C. Dennis, M. Am. Soc. C. E., entitled "Construction Methods for Rogers Pass Tunnel", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

February 21st, 1917.—8.30 P. M.—At this meeting a paper by William M. Hall, M. Am. Soc. C. E., entitled "The Water Supply of Parkersburg, W. Va.", will be presented for discussion.

This paper is printed in this number of *Proceedings*.

SEARCHES IN THE LIBRARY

In January, 1902, the Secretary was authorized to make searches in the Library, upon request, and to charge therefor the actual cost to the Society for the extra work required. Since that time many searches have been made, and bibliographies and other information on special subjects furnished.

The resulting satisfaction, to the members who have made use of the resources of the Society in this manner, has been expressed frequently, and leaves little doubt that if it were generally known to the membership that such work would be undertaken, many would avail themselves of it.

The cost is trifling compared with the value of the time of an engineer who looks up such matters himself, and the work can be performed quite as well, and much more quickly, by persons familiar with the Library.

In asking that such work be undertaken, members should specify clearly the subject to be covered, and whether references to general books only are desired, or whether a complete bibliography, involving search through periodical literature, is desired.

It sometimes happens that references are found which are not readily accessible to the person for whom the search is made. In that case the material may be reproduced by photography, and this can be done for members at the cost of the work to the Society, which is small. This method is particularly useful when there are drawings or figures in the text, which would be very expensive to reproduce by hand.

PAPERS AND DISCUSSIONS

Members and others who take part in the oral discussions of the papers presented are urged to revise their remarks promptly. Written

communications from those who cannot attend the meetings should be sent in at the earliest possible date after the issue of a paper in *Proceedings*.

All papers accepted by the Publication Committee are classified by the Committee with respect to their availability for discussion at meetings.

Papers which, from their general nature, appear to be of a character suitable for oral discussion, will be published as heretofore in *Proceedings*, and set down for presentation to a future meeting of the Society, and on these, oral discussions, as well as written communications, will be solicited.

All papers which do not come under this heading, that is to say, those which, from their mathematical or technical nature, in the opinion of the Committee, are not adapted to oral discussion, will not be scheduled for presentation to any meeting. Such papers will be published in *Proceedings* in the same manner as those which are to be presented at meetings, but written discussions only will be requested for subsequent publication in *Proceedings* and with the paper in the volumes of *Transactions*.

The Board of Direction has adopted rules for the preparation and presentation of papers, which will be found on page 429 of the August, 1913, *Proceedings*.

LOCAL ASSOCIATIONS OF MEMBERS OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS

San Francisco Association, Organized 1905.

President, H. L. Haehl; Secretary, E. T. Thurston, 57 Post Street, San Francisco, Cal.

The San Francisco Association of Members of the American Society of Civil Engineers holds regular bi-monthly meetings, with banquet, and weekly informal luncheons. The former are held at 6 P. M., at the Palace Hotel, on the third Tuesday of February, April, June, August, and October, and the third Friday of December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 P. M., every Wednesday, and the place of meeting may be ascertained by communicating with the Secretary.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in San Francisco, and any such member will be gladly welcomed as a guest.

Colorado Association, Organized 1908.

President, Thomas W. Jaycox; Secretary-Treasurer, L. R. Hinman, 1400 West Colfax Avenue, Denver, Colo.

The meetings of the Colorado Association of Members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be fur-

nished on application to the Secretary. The meetings are usually preceded by an informal dinner. Members of the American Society of Civil Engineers will be welcomed at these meetings.

Weekly luncheons are held on Wednesdays at 12.30 P. M., at Daniel's and Fisher's.

Visiting members are urged to attend the meetings and luncheons.

(Abstract of Minutes of Meeting)

November 11th, 1916.—The meeting was called to order at the Denver Athletic Club; President Jaycox in the chair; L. R. Hinman, Secretary; and present, also, 16 members and 11 guests.

The minutes of the meetings of September 9th and October 7th, 1916, were read and approved.

The Secretary announced the addition of three new members, making the total membership of the Association 90.

Mr. H. S. Crocker reported that the Board of Direction of the Society had decided to hold a second meeting outside of New York City, in rotation in the Geographical Districts, such meeting being for the discussion of technical papers, and that in all probability the meeting would be allotted to the Denver District in 1918.

On motion, duly seconded, President Jaycox appointed a Committee to confer with Governor (elect) Gunter for the purpose of securing the appointment of an engineer to fill the vacancy that will occur on January 1st, 1917, in the State Public Utilities Commission, as follows: Messrs. M. S. Ketchum (Chairman), H. S. Crocker, J. B. Hunter, A. O. Ridgway, and G. M. Bull.

Mr. M. H. Aylesworth, Chairman of the State Public Utilities Commission, addressed the meeting on "State Control of Public Utilities", and was followed by Mr. Fred J. Rankin, Electrical and Telephone Engineer of the Commission, whose subject was "Regulation from an Engineering Standpoint". The subjects were discussed by Messrs. Ketchum, Ridgway, and Wilkinson.

A vote of thanks was tendered Messrs. Aylesworth and Rankin for their instructive papers.

Adjourned.

Atlanta Association, Organized 1912.

President, Paul H. Norcross; Secretary-Treasurer, Thomas P. Branch, Georgia School of Technology, Atlanta, Ga.

The Association holds its meetings at the University Club, Atlanta, Ga. Regular monthly luncheon meetings are held to which visiting members of the Society are always welcome.

Baltimore Association, Organized 1914.

President, H. D. Bush; Secretary-Treasurer, Charles J. Tilden, The Johns Hopkins University, Baltimore, Md.

Cleveland Association, Organized 1914.

President, Robert Hoffmann; Secretary-Treasurer, George H. Tinker, Hickox Building, Cleveland, Ohio.

Detroit Association, Organized 1916.

The regular meetings of the Association are held on the second Friday of December, April, and October, the last being the Annual Meeting.

District of Columbia Association, Organized 1916.

President, A. P. Davis; Secretary-Treasurer, John C. Hoyt, U. S. Geological Survey, Washington, D. C.

Illinois Association, Organized 1916.

President, Onward Bates; Secretary-Treasurer, E. N. Layfield, 4251 Vincennes Avenue, Chicago, Ill.

The regular meetings of the Association are held on the second Monday of March, June, September, and December, the last being the Annual Meeting. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary.

Louisiana Association, Organized 1914.

President, W. B. Gregory; Secretary, Charles W. Okey, Tulane University, New Orleans, La.

The regular meetings of the Association are held at The Cabildo, New Orleans, La., on the first Monday of January, April, July, and October.

Northwestern Association, Organized 1914.

President, George L. Wilson; Secretary, Ralph D. Thomas, 508 South First Street, Minneapolis, Minn.

Philadelphia Association, Organized 1913.

President, Samuel T. Wagner; Secretary, C. W. Thorn, 1313 South Broad Street, Philadelphia, Pa.

The regular meetings of the Association are held at the Engineers' Club of Philadelphia, 1317 Spruce Street, on the first Monday in January, April, and October, the last being the Annual Meeting.

Portland, Ore., Association, Organized 1913.

President, J. P. Newell; Secretary, J. A. Currey, 194 North 13th Street, Portland, Ore.

St. Louis Association, Organized 1914.

President, J. A. Ockerson; Secretary-Treasurer, Gurdon G. Black, 34 East Grand Avenue, St. Louis, Mo.

The meetings of the Association are held at the Engineers' Club Auditorium. The Annual Meeting is held on the fourth Monday in November. The time of other meetings is not fixed, but this information will be furnished on application to the Secretary.

San Diego Association, Organized 1915.

President, W. J. Gough; Secretary-Treasurer, J. R. Comly, 4105 Falcon Street, San Diego, Cal.

(Abstract of Minutes of Meeting)

December 1st, 1916.—The Second Annual Meeting was called to order; President N. B. Kellogg in the chair; J. R. Comly, Secretary.

After the transaction of routine business, the letter-ballots for officers for the ensuing year were canvassed, resulting in the election of the following: President, W. J. Gough; Vice-President, W. S. Post; and Secretary-Treasurer, J. R. Comly.

H. N. Savage, M. Am. Soc. C. E., lectured before the meeting on "Construction and Operation of Water-Works", illustrating his remarks by a number of beautifully colored lantern slides.

Adjourned.

Seattle Association, Organized 1913.

President, A. O. Powell; Secretary-Treasurer, Carl H. Reeves, 444 Henry Building, Seattle, Wash.

The regular meetings of the Association are held at 12.15 P. M., on the last Monday of each month, at The Arctic Club.

Southern California Association, Organized 1914.

President, H. Hawgood; Secretary, W. K. Barnard, 1105 Central Building, Los Angeles, Cal.

The Southern California Association of Members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular bi-monthly meetings, with banquet, at Hotel Clark, on the second Wednesday of February, April, June, August, October, and December, the last being the Annual Meeting of the Association.

Informal luncheons are held at 12.15 P. M. every Wednesday, and the place of meeting may be ascertained from the Secretary.

The by-laws of the Association provide for the extension of hospitality to any member of the Society who may be temporarily in Los Angeles, and any such member will be gladly welcomed as a guest at any of the meetings or luncheons.

(Abstract of Minutes of Meeting)

December 13th, 1916.—The Annual Meeting was called to order at the Hotel Clark; President William Mulholland in the chair; W. K. Barnard, Secretary.

The minutes of the meeting of October 11th, 1916, were read and approved.

Mr. Charles H. Lee, Chairman of the Meteorological Committee, submitted a written report giving a résumé of the work of the Committee for the year. The report was accepted, and the Committee continued. In connection with the report of this Committee, the Secretary was instructed to extend the thanks of the Association to the U. S. Weather Bureau officials stationed at Los Angeles for their assistance and co-operation in the work undertaken by the Committee.

Mr. E. T. Flaherty submitted the report of the Committee on the Licensing of Architects.

Mr. H. Hawgood reported, for the Committee on Industrial Preparedness, that its work had been accomplished, and the Committee was discharged.

President Mulholland announced the election of officers for the coming year, as follows: President, H. Hawgood; Vice-President, Homer Hamlin.

T. D. Allin, M. Am. Soc. C. E., Commissioner of Public Works of Pasadena, Cal., and his City Engineer, Mr. R. V. Orbison, presented an illustrated talk on "What Other Cities in the United States are Doing with Their Sewage".

Adjourned.

Spokane Association, Organized 1914.

President, E. G. Taber; Secretary, B. J. Garnett, City Hall, Spokane, Wash.

The regular meetings of the Association are held on the second Friday of each month, except July and August. The hour and place of meeting are not fixed, but this information will be furnished on application to the Secretary.

Visiting members are invited to attend the meetings and luncheons.

Texas Association, Organized 1913.

President, John B. Hawley; Secretary, J. F. Witts, Dallas, Tex.

Utah Association, Organized 1916.

President, E. C. La Rue; Secretary-Treasurer, H. S. Kleinschmidt, 306 Dooley Building, Salt Lake City, Utah.

**PRIVILEGES OF ENGINEERING SOCIETIES
EXTENDED TO MEMBERS OF THE
AMERICAN SOCIETY OF CIVIL ENGINEERS**

Members of the American Society of Civil Engineers will be welcomed by the following Engineering Societies, both to the use of their Reading Rooms, and at all meetings:

American Institute of Electrical Engineers, 25 West Thirty-ninth Street, New York City.

American Institute of Mining Engineers, 25 West Thirty-ninth Street, New York City.

American Society of Mechanical Engineers, 25 West Thirty-ninth Street, New York City.

Architekten-Verein zu Berlin, Wilhelmstrasse 92, Berlin W. 66, Germany.

Associação dos Engenheiros Cívís Portuguezes, Lisbon, Portugal.

Australasian Institute of Mining Engineers, Melbourne, Victoria, Australia.

Boston Society of Civil Engineers, 715 Tremont Temple, Boston, Mass.

Brooklyn Engineers' Club, 117 Remsen Street, Brooklyn, N. Y.

Canadian Society of Civil Engineers, 176 Mansfield Street, Montreal, Que., Canada.

Civil Engineers' Society of St. Paul, St. Paul, Minn.

- Cleveland Engineering Society**, Chamber of Commerce Building, Cleveland, Ohio.
- Cleveland Institute of Engineers**, Middlesbrough, England.
- Dansk Ingeniorforening**, Amaliegade 38, Copenhagen, Denmark.
- Detroit Engineering Society**, 46 Grand River Avenue, West, Detroit, Mich.
- Engineers and Architects Club of Louisville**, 1412 Starks Building, Louisville, Ky.
- Engineers' Club of Baltimore**, 6 West Eager Street, Baltimore, Md.
- Engineers' Club of Kansas City**, E. B. Murray, Secretary, 920 Walnut Street, Kansas City, Mo.
- Engineers' Club of Minneapolis**, 17 South Sixth Street, Minneapolis, Minn.
- Engineers' Club of Philadelphia**, 1317 Spruce Street, Philadelphia, Pa.
- Engineers' Club of St. Louis**, 3817 Olive Street, St. Louis, Mo.
- Engineers' Club of Toronto**, 96 King Street, West, Toronto, Ont., Canada.
- Engineers' Club of Trenton**, Trent Theatre Building, 12 North Warren Street, Trenton, N. J.
- Engineers' Society of Northeastern Pennsylvania**, 415 Washington Avenue, Scranton, Pa.
- Engineers' Society of Pennsylvania**, 31 South Front Street, Harrisburg, Pa.
- Engineers' Society of Western Pennsylvania**, 2511 Oliver Building, Pittsburgh, Pa.
- Institute of Marine Engineers**, The Minories, Tower Hill, London, E., England.
- Institution of Engineers of the River Plate**, Calle 25 de Mayo 195, Buenos Aires, Argentine Republic.
- Institution of Naval Architects**, 5 Adelphi Terrace, London, W. C., England.
- Junior Institution of Engineers**, 39 Victoria Street, Westminster, S. W., London, England.
- Koninklijk Instituut van Ingenieurs**, The Hague, The Netherlands.
- Louisiana Engineering Society**, State Museum Building, Chartres and St. Ann Streets, New Orleans, La.
- Memphis Engineers' Club**, Memphis, Tenn.
- Midland Institute of Mining, Civil and Mechanical Engineers**, Sheffield, England.
- Montana Society of Engineers**, Butte, Mont.
- North of England Institute of Mining and Mechanical Engineers**, Newcastle-upon-Tyne, England.
- Oesterreichischer Ingenieur- und Architekten-Verein**, Eschenbachgasse 9, Vienna, Austria.
- Oregon Society of Civil Engineers**, Portland, Ore.

- Pacific Northwest Society of Engineers**, 312 Central Building, Seattle, Wash.
- Rochester Engineering Society**, Rochester, N. Y.
- Sachsischer Ingenieur- und Architekten-Verein**, Dresden, Germany.
- Sociedad Colombiana de Ingenieros**, Bogota, Colombia.
- Sociedad de Ingenieros del Perú**, Lima, Peru.
- Societe des Ingenieurs Civils de France**, 19 rue Blanche, Paris, France.
- Society of Engineers**, 17 Victoria Street, Westminster, S. W., London, England.
- Svenska Teknologforeningen**, Brunkebergstorg 18, Stockholm, Sweden.
- Tekniske Forening**, Vestre Boulevard 18-1, Copenhagen, Denmark.
- Vermont Society of Engineers**, George A. Reed, Secretary, Montpelier, Vt.
- Western Society of Engineers**, 1737 Monadnock Block, Chicago, Ill.

ANNUAL REPORT OF THE BOARD OF DIRECTION FOR THE YEAR ENDING DECEMBER 31st, 1916.

In compliance with the Constitution, the Board of Direction presents its report for the year ending December 31st, 1916.

MEMBERSHIP

The changes in membership are shown in the following table:

	JAN. 1ST, 1916.			JAN. 1ST, 1917.			LOSSES.				ADDI- TIONS.		TOTALS.		
	Resident.	Non-Resident.	Total.	Resident.	Non-Resident.	Total.	Transfer.	Resignation.	Dropped.	Death.	Transfer.	Election.	Loss.	Gain.	Increase.
Honorary Members.....	6	6		4	4					2			2		\$2
Corresponding "Members.....	668	2 763	3 431	681	2 833	3 514		19 18	67		+106	*81	104	187	83
Associate Members.....	607	2 880	3 487	625	3 142	3 767	105	41	30	15	+129	842	191	471	280
Associates.....	68	99	167	66	102	168	1	1	4	3		10	9	10	1
Juniors.....	147	656	803	132	503	635	120	23	48	2		119	197	119	\$78
Fellows.....	6	8	14	5	8	13				1			1		\$1
Totals.....	1 496	6 413	7 909	1 506	6 668	8 192	235	84	95	90	235	552	504	787	283

* 1 Reinstatement.

† 105 Associate Members, 1 Associate.

‡ 129 Juniors.

§ Decrease.

It will be noted that the net increase in membership for the year was 283.

The number of applications received during 1916 was 884: 627 for admission and 257 for transfer.

The losses by death during the year number 90 and are as follows:

Honorary Members (2): Grenville Mellen Dodge, Don Juan Whittemore.

Members (67): Thomas Appleton, Miguel de Teive e Argollo, Robert James Beach, Edward Manning Bigelow, Richard Parkhurst Bloss, Virgil Gay Bogue, Charles Adolphus Caldwell, Edward Canfield, Walter Frank Carr, Charles Hopkins Cartlidge, Amory Coffin, Cloud Clifford Conkling, Elmer Lawrence Corthell, David West Cunningham, Daniel Burke Dunn, John Waldó Ellis, Theodore Newell Ely, Asa Betts Fitch, Henry Floy, William Wallace Follett, George Aiken Gilfillan, Carl Robert Grimm, Henry Arthur Hall, Arthur Hider, Sidney Willett Hoag, Jr., Frederick William Doane Holbrook, Charles Wilcox Hotchkiss, William Edwin Hoyt, William Henry Jaques, John Howard Johnston, Frederic Charles Kunz, Erasmus Darwin Leavitt, Daniel McCool, Thomas Francis McCrickett, Theodore Hall McKenzie, Henry Coathupe Mais, William Ridley Neely, William Jasper Nicolls, Joseph Otis

Osgood, Harold Parker, William Rodney Patterson, Charles Henry Preston, Joseph Ramsey, Louis Henry Rathmann, James Vincent Rockwell, Grant Rohrer, Henry Rohwer, Robert Maitland Roy, Leonard Warren Rundlett, Charles Conrad Schneider, Frank Edson Shedd, Frank Oscar Sinclair, William Sooy Smith, Charles Soosmith, Frank McMillan Stanton, George Way Swinburne, Ernest Frederick Tabor, Sledge Tatum, Stevenson Towle, George Washington Vaughn, Theodore Voorhees, Charles Perkins Webber, Edmund Brownell Weston, James Knapp Wilkes, David Williams, Charles Jephtha Hill Woodbury, Arthur Francis Wrotnowski.

Associate Members (15): Augustus Waterous Agnew, William Frederick Alfred Anson, Robert Hammond Boynton, Lester Lyman Coleman, Frank Joseph Conlon, George Lenox Crawford, Frans Engström, Loren Edward Hunt, José Petronio Katigbak, Stanley Hastings McMullen, Philip Henry Parthesius, Roy Karl Schlafly, William Thomas Shaw, George Edward Vansittart, James Madison Warner.

Associates (3): Ludlow Victor Clark, William Cooper Cuntz, Charles Wilson Ross.

Juniors (2): Curtiss Millard, Roger Tappan.

Fellows (1): James Jerome Hill.

LIBRARY

The total contents of the Library and the increase from January 1st to October 1st, 1916, are shown in the following statement:

	Total Contents.	Increase during 1916.
Bound volumes.....	26 858	986
Unbound volumes.....	49 170	1 439
Specifications	8 043	174
Maps, photographs, and drawings....	5 275	39
Total.....	*89 346	2 638

Of these, 934 were donations received in answer to special requests; 58 were donations from publishers; 1 478 were donations received in regular course, and 168 were purchased.

The value of accessions to the Library during the year is as follows, each accession having been valued separately as received:

Donations and exchanges (estimated value)...	\$1 861.65
168 volumes purchased (cost).....	340.76
Binding 251 volumes.....	302.31
	<hr/> \$2 504.72

* If the increase during the year be added to the total contents of the Library as given in last year's report, the resulting figure would be 90 067. The discrepancy is due to consolidation of many pamphlets heretofore accessioned separately. 408 have been added since consolidation of the Library with that of the United Engineering Society, and in addition 750 have been received which have not as yet been accessioned.

The following amounts have been expended upon the Library during the year:

Purchases, subscriptions, and binding.....	\$829.45
Fixtures, supplies, express charges, etc.....	95.54
Total.....	<u>\$924.99</u>

The card index now contains about 103 000 cards.

During the year 91 new searches or bibliographies (containing 2 587 separate references) have been made, and copies of 21 searches made in previous years have been furnished to members and others. The total cost of this work, \$672.79, has been charged to those for whom it was undertaken.

There have been 153 articles or illustrations reproduced by photography from books in the Library at a cost of \$46.21.

For a little more than two years (since November, 1914), the references to current technical literature which have for many years been published monthly in *Proceedings* have been written on cards, in such form that after they have served their purpose as copy for the printer, they are filed for reference under specific headings. Thus has been started an up-to-date, and easily consulted, index to more than 112 engineering periodicals and society publications, containing about 20 000 cards.

The total attendance in the Reading Room and Library during the year was 3 860. This does not include those who use the Library during the semi-monthly meetings.

Since October 1st the Library has been under the management of the United Engineering Society Library Board, although still on the shelves of the Society House. While the Librarians have been part of the staff of the U. E. S. Library, as a matter of convenience they have been under the direction of the Secretary of the Society, and will remain so until the books are moved. The work of getting ready to move the Library to the Thirty-ninth Street Building necessitated examining each one of the 88 938 accessions, and the marking of those which were found to be duplicates. This work was finished during the year, and it was ascertained that 67 242 of the accessions in the Library of this Society were not duplicated in the U. E. S. Library.

The Reading Room service has been maintained, searches have been made, and other Library work carried on just as in the past with the exception that no additions have been made to the Library since October 1st, which accounts for the somewhat small number of accessions during the year.

It is expected that shelving will be ready at the Thirty-ninth Street Building within a short time, and as soon as the books are moved to that Building and become physically a part of the U. E. S. Library,

all correspondence about Library matters should be carried on by the membership with the Librarian of the United Engineering Society. Notice of this will be given to the members in *Proceedings*.

SPECIAL COMMITTEES

There are at present nine Special Committees appointed to report on Engineering subjects, the membership of which consists of 69 members of the Society. In these 69, however, there are some duplications.

In connection with the work of these Committees, meetings have been held, the minutes of which have been published in *Proceedings*, and reports have been presented by all of them either at the Annual Meeting of 1916, or have been received for presentation to the Annual Meeting of 1917, the reports from the Special Committees on Valuation of Public Utilities, Concrete and Reinforced Concrete, and to Investigate Conditions of Employment of, and Compensation of, Civil Engineers, being final reports.

During the year contributions of \$2 500 each have been received from the Bethlehem Steel Company, the Cambria Steel Company, and the Lackawanna Steel Company, toward the work of the Special Committees to Report on Stresses in Railroad Track and on Steel Columns and Struts. The sum of \$4 115.07 has been expended by the Society for the work of Special Committees.

PUBLICATIONS

During the year, ten numbers of *Proceedings*, one volume of *Transactions*, and one Year Book, have been issued.

In *Proceedings* the list of references to current engineering literature has been continued, and has covered 146 pages and contained 6 825 classified references to 112 periodicals.

The stock of the various publications of the Society, kept on hand for the convenience of members and others, now amounts to 179 672 copies, the cost of which to the Society, for paper and press work only, has been \$29 233.43.

During the year 5 557 volumes of *Transactions* have been bound for members and others in standard half-morocco and cloth bindings.

SUMMARY OF PUBLICATIONS FOR 1916.

	Issues.	Average Editions.	Total Pages.	Plates.	Cuts.
<i>Transactions</i> Volume LXXX....	1	8 400	2 301	70	544
<i>Proceedings</i> (monthly numbers)...	10	8 350	2 892	15	355
Year Book.....	1	8 800	356	1	1
Total.....	12	5 549	86	899

The cost of publications has been:

For Paper, Printing, etc., <i>Transactions</i> and <i>Proceedings</i> ..	\$33 333.68
For Plates and Cuts.....	1 403.12
For Boxes, Mailing Lists, Copyright, and Sundry Expenses.	908.85
For 10 825 Extra Copies of Papers and Memoirs.....	1 010.09
For Year Book.....	2 629.20
Total.....	\$39 284.94
Deduct amount received from sale of publications.....	3 220.24
Net expenditure for publications for 1916.....	\$36 064.70

The net cost of publications for 1916 is \$12 099.23 less than that for 1915, which is due to two causes: First, a recommendation of the Board of Direction that the expense of publication should be cut down as much as possible during this year in view of several financial problems which confronted the Society; and secondly, to a strong effort made by the Committee to enhance the value of the Society publications for the use of the busy Engineer by the exclusion of unnecessary tabular matter and illustrations, and the elimination of matter which elaborates well-known theory and practice, confining descriptions of accomplished work to those parts which describe novel methods, and, in a general way, adding to the efficiency of the publications and consequently to the economy of their production.

CHANGE OF SOCIETY HEADQUARTERS

The project of joining the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, in the ownership and occupancy of the United Engineering Society Building on West Thirty-ninth Street, which was started in June, 1915, has progressed with some rapidity during 1916. The Board of Direction formulated the project, and it was submitted to a referendum of the entire Corporate Membership. The vote on the acceptance of the main proposition was 2 500 in favor and 390 against, and was also largely in favor of the plan of increasing the height of the building by the addition of three stories. This is the plan which is now being executed. It was necessary to carry the three additional stories on four columns extending through the present building, and that part of the work has been finished, and a contract for the completion of the addition has been already awarded. While there has been much delay on account of slow deliveries of steel, etc., it is hoped that the building will be ready for occupancy toward the latter part of the summer of 1917. The present property of the Society in 57th Street has been placed on the market.

MEETINGS

Twenty-five meetings were held during the year, as follows: At the Annual Meeting, 2; at the Annual Convention, 2; and 21 other meetings, all of which were held at the Society House.

At these meetings there were presented twenty formal papers, six of which were illustrated with lantern slides, four lectures, all of which were illustrated with lantern slides, and four informal discussions, one of which was illustrated with lantern slides. There were also four papers published which were not presented for discussion at any meeting of the Society. The number of members and others who took part in the preparation or discussion of these papers and lectures was 225.

The Forty-eighth Annual Convention was held at Pittsburgh, Pa.

The total attendance at the 25 meetings was about 4 975. The registered attendance at the Annual Meeting was 1 200, and at the Annual Convention, 514, but there were many guests present at all these meetings, and also members who failed to register.

At each of the ordinary semi-monthly meetings held during the year collations have been served, and these have been paid for out of the Society funds, in accordance with the action of the Annual Meeting of 1912.

MEDALS AND PRIZES

For the year ending with the month of July, 1915, prizes were awarded as follows:

The Norman Medal to Allen Hazen, M. Am. Soc. C. E., for his paper entitled "Storage to be Provided in Impounding Reservoirs for Municipal Water Supply."

The J. James R. Croes Medal to Richard R. Lyman, Assoc. M. Am. Soc. C. E., for his paper entitled "Measurement of the Flow of Streams by Approved Forms of Weirs with New Formulas and Diagrams."

The Thomas Fitch Rowland Prize to Charles W. Staniford, M. Am. Soc. C. E., for his paper entitled "Modern Pier Construction in New York Harbor."

The James Laurie Prize to J. E. Greiner, M. Am. Soc. C. E., for his paper entitled "Coal Piers on the Atlantic Seaboard."

The Collingwood Prize for Juniors to George Schobinger, Jun. Am. Soc. C. E. (now Assoc. M. Am. Soc. C. E.), for his paper entitled "Colorado River Siphon."

FINANCES

It will be noted on the Balance Sheet that \$54 000.00 has been paid to the United Engineering Society on account of the building expenses, the arrangement being that this Society will furnish the money for this operation, the total cost not to exceed \$250 000.

The Building Committee, however, finds that due to the great and unexpected increase in cost of material, the total cost will certainly exceed \$250 000, and has asked each of the four Founder Societies to become responsible for its share of an additional amount, which it is estimated will be \$50 000. Your Board has acted favorably on this proposition.

In order to raise funds to meet the necessary expenses of building, a mortgage of \$200 000, at 5%, has been placed upon the Society property, which was entirely free. Only \$20 000 of this amount was drawn at the time of the execution of the mortgage, and arrangements have been made by which additional amounts will be received when needed, thus saving unnecessary interest charges.

The reports of the Secretary and Treasurer are appended.

By order of the Board of Direction,

CHAS. WARREN HUNT,

Secretary.

JANUARY 15TH, 1917.

REPORT OF THE SECRETARY FOR THE

TO THE BOARD OF DIRECTION OF THE

GENTLEMEN:—I have the honor to present a statement of Receipts and Disbursements for the fiscal year of this Society, ending December 31st, 1916. I also append a general balance sheet showing the condition of the affairs of the Society.

Respectfully submitted,

CHAS. WARREN HUNT,

Secretary.

RECEIPTS.

Balance on hand December 31st, 1915, in Bank, Trust Company, and in hands of Secretary.....	\$9 474.44
Entrance Fees	\$14 740.00
Current Dues.....	89 058.19
Past Dues.....	5 446.18
Advance Dues.....	30 425.76
Certificates of Membership.....	716.41
Badges	3 314.50
Sales of Publications.....	3 220.24
Library	1 066.31
Annual Meeting.....	1 673.67
Binding	7 236.87
Interest	3 768.11
Miscellaneous	755.19
General Printing.....	159.47
Bond and Mortgage.....	18 310.00
Work of Committees.....	7 500.00
80 — 4% and 44½% New York City Bonds, sold.	81 787.50
	<hr/>
	269 178.40

FINANCES
\$278 652.84

YEAR ENDING DECEMBER 31st, 1916.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

DISBURSEMENTS.

Salaries of Officers.....	\$15 100.00
Mileage of Directors.....	5 486.58
Mileage of Nominating Committee.....	589.32
Work of Committees (Including Mileage, \$1 354.58).....	4 115.07
Clerical Help.....	23 107.82
Caretaking.....	1 760.12
Publications.....	39 284.94
Postage.....	6 623.88
General Printing.....	3 334.98
Office Supplies.....	1 230.22
House Supplies.....	175.67
Library.....	1 838.34
Library Maintenance.....	95.54
Badges.....	2 149.50
Certificates of Membership.....	513.30
Binding.....	3 924.32
Prizes.....	272.52
Annual Convention.....	438.09
Annual Meeting.....	2 753.13
Buildings.....	64.05
Betterments.....	40.00
Maintenance of House.....	388.45
Heat, Light and Water.....	1 330.38
Furniture.....	127.35
Interest.....	630.53
Insurance.....	290.00
Current Business (Includes Telephone Service and all Expenses of Meetings).....	3 736.62
Petty Expenses.....	214.97
International Engineering Congress, 1915....	3 240.00
Bond and Mortgage.....	50 000.00
United Engineering Building, Enlargement...	54 000.00
Change of Society Headquarters.....	942.06
Miscellaneous.....	966.81
	<hr/>
	\$228 764.56
Balance on hand, December 31st, 1916:	
In Garfield National Bank.....	\$48 388.28
In Hands of Secretary.....	1 500.00
	<hr/>
	49 888.28
	<hr/>
	\$278 652.84
	<hr/>

50000.00
50000.00
50000.00

140.16
48.38
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

50000.00
50000.00
50000.00

GENERAL BALANCE SHEET, DECEMBER 31ST, 1916.
ACCOMPANYING REPORT OF THE SECRETARY.

ASSETS.		LIABILITIES.	
Three Lots (Actual cost \$185 406.20)		Dues for 1917 paid in Advance.....	\$30 425.76
Estimated Value.....	\$350 000.00	Mortgage Debt.....	20 000.00
Building (Cost, less 2% annually for depreciation)	128 071.93	Interest Accrued on Mortgage.....	46.58
Furniture (Cost, less 60% depreciation)	9 527.39	U. E. S. (Library Account).....	149.16
Publications on hand (inventoried cost)	29 233.43	Funds Invested in Society House, Lots and Library*	28 015.78
New York City non-taxable bonds (Market value).....	10 300.00	Herbert Stewart Library Fund.....	2 060.00
Interest accrued on Investments.....	141.57	Gen. Joseph G. Swift Library Fund..	1 030.00
Library: Cash expended for books, etc.....	\$22 122.22	Balance of Donations on account of Work of Special Committees.....	5 453.91
Donations (estimated)	72 310.88	Surplus (including Reserve Fund of \$7 210.00)	663 195.14
United Engineering Society, Treasurers Receipts for cash payments, a/c enlargement of building.....	54 000.00		
Due from Members.....	14 529.70		
" " (Binding of Vol. 80)	4 542.50		
Due from Non-Members.....	5 465.47		
Unexpired Fire Insurance (Premium)	243.01		
Cash	49 883.28		
	<u>\$750 376.33</u>		<u>\$750 376.33</u>

We have audited the accounts of the American Society of Civil Engineers for the year ended December 31st, 1916, and (assuming that the estimate of the property valuation is correct) we certify that in our opinion the above Balance Sheet shows correctly the financial condition of the Society as of that date.

NEW YORK,
JANUARY 12TH, 1917.

LYBRAND, ROSS BROS. & MONTGOMERY,
Certified Public Accountants.

* Compounding Dues Fund, \$11 765.00; Norman Medal Fund, \$1 000.00; Rowland Prize Fund, \$1 222.50; Collingwood Prize Fund, \$1 000.00; Fellowship Fund, \$13 038.28.

REPORT OF THE TREASURER.

In compliance with the provisions of the Constitution, I have the honor to present the following report for the year ending December 31st, 1916:

Balance on hand, December 31st, 1915.....	\$9 474.44	
Receipts from current sources, January 1st to December 31st, 1916.....	\$161 580.90	
Sold, 80 New York City 4% and 4½% Bonds..	81 787.50	
Donations on account of Special Committees (Stresses in Railroad Tracks, and Steel Col- umns and Struts).....	7 500.00	
First Installment on new Mortgage Loan	\$20 000.00	
Expenses on account of Mortgage Loan	1 690.00	18 310.00
		<hr/>
		\$269 178.40
Payment of Audited Vouchers for Current Business, January 1st to December 31st, 1916.	120 582.50	
Payment of Mortgage (Balance).....	50 000.00	
Payments on account of United Engineering Building Enlargement.....	54 000.00	
International Engineering Congress, 1915....	3 240.00	
Change of Society Headquarters.....	942.06	
Balance on hand, December 31st, 1916:		
In Garfield National Bank.....	\$48 388.28	
In hands of the Secretary.....	1 500.00	49 888.28
		<hr/>
	\$278 652.84	\$278 652.84

Respectfully submitted,

LINCOLN BUSH,

Treasurer.

NEW YORK, JANUARY 15TH, 1917.

ACCESSIONS TO THE LIBRARY

(From December 3d to December 30th, 1916)

DONATIONS*

WATER-SUPPLY:

Considered Principally from a Sanitary Standpoint. By William P. Mason, M. Am. Soc. C. E. Fourth Edition, Rewritten. Cloth, 9½ x 6 in., illus., 10 + 528 pp. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Limited, 1916. \$3.75. (Donated by the Author.)

The third edition of this book was published in 1902. It is stated, however, that so much that is new has been added to our knowledge on the subject of Water Supply that it has been necessary to rewrite considerable portions of the original text and to make many additions. After a short introductory chapter relative to the history of ancient water supplies, the author discusses the pollution of drinking water and its resulting diseases. This is followed by chapters on the artificial and natural purification of water in which he describes the various kinds of filters, both American and European, their construction, operation, maintenance, etc., as well as purification by nitrification, agitation, aeration, sedimentation, etc., together with a brief account of the laws relative to the pollution of streams. There are also chapters on impurities in rain, ice, and snow, and their effect on water supplies, the variations in river and stream water, the bacteriology of flowing water, stored water, ground-water, and deep-seated water, with descriptions of methods for obtaining and purifying such waters. Chapter X contains statistics of per capita supplies in American and European cities, influence of meters on waste, water consumption, etc., and Chapter XI is devoted to a discussion of the action of water on various metals. There are also Appendices on the analyses of sea-water, and on the pollution of streams and water supplies. The Contents are: Introductory; Drinking-Water and Disease; Artificial Purification of Water; Natural Purification of Water; Rain, Ice, and Snow; River and Stream Water; Stored Water; Ground-Water; Deep-Seated Water; Quantity or Per Capita Daily Supply; Action of Water upon Metals; Appendix A, Analyses of Sea Waters; Appendix B, Rights and Duties Regarding the Pollution of Streams; Appendix C, Typhoid Fever Contracted from Drinking Polluted Water Decided to be "an Accident"; Index.

HYDRO-ELECTRIC POWER:

Volume I, Hydraulic Development and Equipment; Volume II, Electrical Equipment and Transmission. By Lamar Lyndon. Cloth, 9½ x 6½ in., illus., 2 vol. New York, McGraw-Hill Book Company, Inc.; London, Hill Publishing Co., Ltd., 1916. Vol. I, \$5.00; Vol. II, \$3.50.

It was the author's intention, it is stated, to publish this work in one volume, but, in order to make it less cumbersome and more convenient for reference, the subject-matter has been divided into two volumes. The author's aim has been, it is said, to produce an accurate, clear and complete work for the guidance of engineers in the practical design of hydro-electric plants, which is founded on experience and accepted practice. Scientific discussions of various hypotheses and theories have been omitted, it is stated, except where they are essential to the understanding of the subjects treated. In Volume I, it is said, certain methods of treatment described are new and consistent adherence to the physics of the problems has been maintained throughout the work. A number of new and original formulas are presented, among which are the exact formulas for solid dams and for the magnitude and location of the resultants of forces acting on dams. The author, it is stated, also takes issue with the theory of uplift pressure under solid dams, as generally accepted by the Profession. In Volume II, the fundamentals of electric circuits are discussed from a physical instead of a mathematical standpoint for the convenience of the engineer who already understands the principles of electric circuits and alternating currents. The author, it is stated, prefers wooden or concrete poles for supporting transmission lines and in a short discussion of the subject gives his reasons for such preference. He has also included Mr. H. B. Dwight's chart for the solution of transmission line problems, as it constitutes, it is said, an admirable method of quick computation and saves both time and labor. The Contents are: Volume I, Hydraulic Development and Equipment: General Conditions; Flow in Streams; Weirs and Orifices; Power Variation and Storage; Artificial Waterways; Pipe Lines and Penstocks; Dams; Movable Crests for Dams; Headworks; Water Wheels; Speed Regulation of Water Wheels and Abnormal Penstock Problems; Mathematical

* Unless otherwise specified, books in this list have been donated by the publishers.

Tables; Index. Volume II, Electrical Equipment and Transmission: Alternating Current Generators; Transformers; Switchboards; Cranes; Design and Testing of Power Stations; Wires and Cables; Insulators; Pole and Tower Lines; Electric Circuits; Calculation of Transmission Lines; Deflection and Mechanical Stresses in Transmission Lines; Line Protection and Accessories; Substations; Index.

THE PORTLAND CEMENT INDUSTRY:

A Practical Treatise on the Building, Equipping and Economical Running of a Portland Cement Plant, with Notes on Physical Testing. By William Alden Brown, Assoc. Am. Soc. C. E. Cloth, $8\frac{1}{2} \times 5\frac{1}{2}$ in., illus., 10 + 158 pp. London, Crosby Lockwood and Son, 1916. (Donated by the Author.)

The preface states that neglect, delay, or failure, on the part of British cement manufacturers to study, adopt, and improve methods of economical production will lose for them the markets of the world for Portland cement. He has, therefore, it is stated, spent much time and taken great pains to insure accuracy in this treatise on that subject, to divest it of its scientific technicalities, and to present a clear, simple, and realistic description of the actual and economical manufacture of this important building material. The first three chapters of the book are devoted to a historical review of the subject, the raw materials used in the manufacture of cement are described and proportions included, and a detailed description is given of the design and construction of a modern plant as well as of its equipment and operation. Cost statistics relative to the manufacture of Portland cement are also given, and Chapters XI to XVI inclusive, are devoted to its physical testing. The Chapter headings are: Introductory; Historical; Development of the Industry; Manufacture-Raw Materials; Design and Construction of a Modern Portland Cement Plant; The Rotary Kiln; Power Plants; Miscellaneous; Costs and Statistics; Equipment; Physical Testing; Development of Cement Testing; Chemical Composition; Fineness; Tensile Strength; Time of Setting; Soundness or Constancy of Volume; Index.

Gifts have also been received from the following:

- | | |
|---|--|
| Academie des Sciences. 1 pam. | Mississippi River Comm. 1 pam. |
| Am. Ceramic Soc. 1 bound vol. | Montreal, Que.-City Council. 1 bound vol. |
| Am. Ry. Assoc. 1 pam. | Municipal Engrs. of the City of New York. 1 pam. |
| Am. Telephone & Telegraph Co. 2 pam. | National Fire Protection Assoc. 2 pam. |
| Belzner, Theodore. 1 pam. | National Paving Brick Mfrs. Assoc. 1 bound vol. |
| Bond, Paul S., and J. M. McDonough. 1 bound vol. | New South Wales-Sydney Harbour Trust Commrs. 1 pam. |
| California-R. R. Comm. 1 bound vol. | New York City-Dept. of Docks and Ferries. 1 bound vol. |
| California-State Water Problems Conference. 2 pam. | New York State-Museum. 1 vol. |
| California, Univ. of. 1 pam. | New York Public Library. 61 bound vol., 104 pam. |
| Canada-Dept. of Marine and Fisheries. 1 vol. | Newark, N. J.-Board of Street and Water Commrs. 2 pam. |
| Canada-Irrig. Branch. 2 pam. | Nova Scotian Inst. of Science. 1 pam. |
| Cincinnati, New Orleans & Texas Pacific Ry. Co. 1 pam. | Ohio-Geol. Survey. 1 bound vol. |
| Colombia-Ministerio de Relaciones Exteriores. 1 vol. | Ohio State Univ. 1 vol. |
| Eliff, G. 1 pam. | Oregon-State Engr. 1 pam. |
| Everett, Mass.-Mayor. 1 pam. | Ottawa, Ont.-Mines Branch. 1 pam. |
| Geneva, N. Y.-Board of Public Works. 1 pam. | Pennsylvania-Public Service Comm. 3 pam. |
| Hawaii-Board of Health. 1 pam. | Perry, Francis W. 1 pam. |
| Illinois, Univ. of. 1 pam. | Philadelphia, Pa.-Bureau of Surveys. 1 bound vol. |
| Indiana-State Library. 1 pam. | Philadelphia, Pa.-Mayor. 3 bound vol. |
| Institution of Civil Engrs. 1 bound vol., 1 pam. | Portland Cement Assoc. 1 pam. |
| Institution of Civil Engrs. of Ireland. 1 pam. | Porto Rico-Governor. 1 vol. |
| Iowa State Coll. of Agriculture. 3 pam. | Presidents' Conference Committee. 6 pam. |
| Kansas City, Mo.-Board of Fire and Water Commrs. 1 pam. | Princeton Eng. Assoc. 1 pam. |
| Leeds, England-Sewerage Comm. 1 pam. | St. Louis, Mo.-City Plan Comm. 1 pam. |
| Manchester, England-Cleansing Dept. 1 pam. | Seattle, Wash.-Lighting Dept. 1 pam. |
| Manchester Steam Users Assoc. 1 pam. | Smithsonian Institution. 4 pam. |
| Massachusetts-Bureau of Statistics. 1 bound vol. | South Australia-Rys. Commr. 1 pam. |
| Metcalf, Leonard. 3 vol. | Texas, Agricultural and Mech. Coll. of. 2 pam. |

Toledo, Peoria & Western Ry. Co. 1 pam.	U. S.-Engr. Office, San Francisco, Cal. 1
Union of South Africa-Geol. Survey. 1	pam., 1 specif.
pam.	U. S.-Engr. Office, Washington, D. C. 1
Union Univ. 1 vol.	pam.
U. S.-Bureau of Insular Affairs. 1 pam.	U. S.-Engr. Office, Wheeling, W. Va. 3
U. S.-Bureau of Medicine and Surgery. 1	specif.
pam.	U. S.-Geological Survey. 2 vol.
U. S.-Bureau of Mines. 2 pam.	U. S.-Lake Survey Office. 7 charts.
U. S.-Bureau of Plant Industry. 2 pam.	U. S.-Library of Congress. 1 bound vol.,
U. S.-Bureau of the Census. 2 pam.	1 pam.
U. S.-Bureau of Yards and Docks. 1 pam.	U. S.-Naval Observatory. 1 pam.
U. S.-Commr. of Lighthouses. 1 pam.	U. S.-Navy Dept. 2 pam.
U. S.-Commr. of Navigation. 1 pam.	U. S.-Panama Canal-Governor. 1 vol., maps.
U. S.-Dept. of Agriculture. 2 pam.	U. S.-Philippine Comm. 1 bound vol.
U. S.-Engr. Office, Pittsburgh, Pa. 1 pam.	U. S.-Signal Office. 1 pam.

SUMMARY OF ACCESSIONS

(From December 3d to December 30th, 1916)

Donations (including 4 duplicates)..... 287

MEMBERSHIP

(From December 8th, 1916, to January 4th, 1917)

ADDITIONS

MEMBERS		Date of Membership.
BASSETT, HERBERT HOWARD. Contr. Engr., Berlin Constr. Co.; Res., 5 Iowa St., Worcester, Mass.....		Nov. 28, 1916
CANADY, CURTIS MARION. Engr., Bridge Drawing Room, Ambridge Plant, Am. Bridge Co., 618 Park Rd., Ambridge, Pa.....		Oct. 10, 1916
CASE, MONTGOMERY BABCOCK. 220 South Michigan Ave., Chicago, Ill.....		Nov. 28, 1916
DINGLE, JAMES HERVEY. City Engr., Charles- ton, S. C.....	Jun. April 30, 1895 Assoc. M. Oct. 4, 1899 M. Nov. 28, 1916	
FOUILHOX, JACQUES ANDRE. Cons. Engr. (Whitehouse & Fouilhoux), 619 Ry. Exchange Bldg., Portland, Ore.....	Assoc. M. Oct. 5, 1909 M. Oct. 10, 1916	
GRAM, LEWIS MERRITT. Prof. of Structural Eng., Univ. of Michigan, 912 Oakland Ave., Ann Arbor, Mich.....	Assoc. M. June 1, 1909 M. Nov. 28, 1916	
HILT, FRED KEATING. Works Mgr. and Div. Engr., Hudson & Manhattan R. R., Ridgewood, N. J.....		Nov. 28, 1916
HOWE, HERBERT FRANK. 100 Payson Rd., Belmont, Mass.....	Assoc. M. Oct. 2, 1907 M. Nov. 28, 1916	
HOWE, WALTER CLARK. Div. Engr., California Highway Comm., Union National Bank Bldg., San Luis Obispo, Cal.....	Assoc. M. May 31, 1910 M. Nov. 28, 1916	
NEELD, ALMOS DAVIDSON. 237 Fourth Ave., Pittsburgh, Pa.		Nov. 28, 1916
PEASE, HAROLD TAPLEY. Chf. Engr., Arcadia Orchards Co., Deer Park, Wash.....	Assoc. M. Jan. 2, 1912 M. Oct. 10, 1916	
THEBO, FENWICK MILFORD. Supt. of Constr., Phoenix Constr. Co., Grace, Idaho.....		Nov. 28, 1916
WELDIN, WILLIAM ARCHIE. Engr. and Surv. (Blum, Weldin & Co.), St. Nicholas Bldg., Pittsburgh, Pa...		Nov. 28, 1916
WEST, JUDSON RAY. Prof. of Ry. Eng., Pei Yang Univ., Tientsin, China.....	Assoc. M. April 30, 1912 M. Oct. 10, 1916	

ASSOCIATE MEMBERS

ALEXANDER, RAYMOND GLIME. Structural Engr., W. B. Ittner, 5828 Westminster Pl., St. Louis, Mo.....		Nov. 28, 1916
BACKUS, MURRAY JAMES. Asst. Engr., Punta Alegre Sugar Co., Care, P. B. Anderson, Caibarien, Cuba.....	Jun. Oct. 4, 1910 Assoc. M. Nov. 28, 1916	
BARTHOLOMEW, BRADLEY WHITE. Engr. of Constr., Flynt Bldg. & Constr. Co., Palmer, Mass.....		Nov. 28, 1916

ASSOCIATE MEMBERS (Continued)		Date of Membership.
BLACK, WALTER GLEN. (Black & Griffin), Mandan, N. Dak.....		Nov. 28, 1916
BOWERSMITH, JOHN EVERETT. Engr., Bates, Borland & Ayer, 4008 Randolph Ave., Oakland, Cal.....		Nov. 28, 1916
BRONSON, HOWARD FRANKLIN. Asst. Engr., Water Supply Comm. of Pennsylvania, 1855 Zarker St., Harrisburg, Pa.....	Jun. Assoc. M.	Nov. 1, 1910 June 23, 1916
BUCK, ROSS JUDSON. Supt. of Constr., Marion County Tuberculosis Sanatorium, 2204 North Alabama St., Indianapolis, Ind..	Jun. Assoc. M.	June 30, 1911 Nov. 28, 1916
BUCK, WALTER VAN. Supt. of Constr., A. Jaicks Co., Newton, Kans.....	Jun. Assoc. M.	July 9, 1912 Nov. 28, 1916
BURTON, WILLIAM ARTHUR. Chf. Engr., Paris & Mt. Pleasant R.R., Mt. Pleasant, Tex..	Jun. Assoc. M.	June 6, 1911 Oct. 10, 1916
CASTILLO Y GRAU, ANTONIO. Engr., Board of Health, P. O. Box 1669, Cienfuegos, Cuba	Jun. Assoc. M.	June 6, 1911 Sept. 12, 1916
CHAPPEL, MILFORD EDWARD. New Holland, N. C.....		Nov. 28, 1916
COCK, CALVIN EARNEST. Honey Grove, Tex.....		Nov. 28, 1916
CRANDALL, CARL. 316 Hector St., Ithaca, N. Y. }	Jun. Assoc. M.	Oct. 1, 1912 Nov. 28, 1916
CURREY, JOHN WAGGONER. Civ. Engr. and Surv., Cleveland, Miss.....	Jun. Assoc. M.	Sept. 6, 1910 Nov. 28, 1916
DAVISON, ALLEN STEWART. Engr., Allen S. Davison Co., Inc., The Basic Products Co., The Sharpsville Furnace Co., and The Bessie Furnace Co., 2514 Oliver Bldg., Pittsburgh, Pa.....	Jun. Assoc. M.	Mar. 1, 1910 Nov. 28, 1916
DENSLEY, FRANK HASKELL. Eng. Examiner, New York State Civ. Service Comm., 825 Myrtle Ave., Albany, N. Y.....	Jun. Assoc. M.	July 1, 1909 Nov. 28, 1916
EDWARDS, RAYMOND ARDEN. Engr., Bates, Borland & Ayer, 185 Dolores St., San Francisco, Cal.....	Jun. Assoc. M.	June 24, 1914 Nov. 28, 1916
EMBURY, AYMAR, 2D. Archt., 132 Madison Ave., New York City		Nov. 28, 1916
FRAME, STANLEY HOWARD. Dist. Hydrometric Engr., Dept. of the Interior, Irrig. Branch, P. O. Box 2318, Calgary, Alberta, Canada.....		June 23, 1916
GAMBLE, NEIL MCADORY. Chf. Engr. and R. R. Supt., Cuyamel Fruit Co., 1425 Whitney Central Bldg., New Orleans, La.....		Nov. 28, 1916
GEORGE, SIDNEY HOWARD. Asst. Engr., C., M. & St. P. Ry., Harbona, Idaho.....		Nov. 28, 1916

ASSOCIATE MEMBERS. (Continued)

		Date of Membership.
GOTWALS, JOHN CARL. Lieut., U. S. Corps of Engrs., Washington Barracks, Washing- ton, D. C.	Jun. } Assoc. M. }	May 5, 1908 Nov. 28, 1916
HABE, HARLAN TYLEE. Chf. Engr., Duluth & North. Minn. Ry., Duluth, Minn.		Sept. 12, 1916
HAYDOCK, CHARLES. Prin. Asst. Engr., The Mountain Water Supply Co., 922 Com- mercial Trust Bldg., Philadelphia, Pa.	Jun. } Assoc. M. }	June 4, 1913 Nov. 28, 1916
JAMISON, RICHARD HARVEY. City Engr., City Hall, Ala- meda, Cal.		Nov. 28, 1916
JOHNSON, NATHAN CLARKE. Cons. Engr., 149 Broadway, New York City.		Sept. 12, 1916
KELLEY, GEORGE NORBERT. Care, Interstate Commerce Comm., Interstate Bldg., Kansas City, Mo.	Jun. } Assoc. M. }	June 3, 1915 Nov. 28, 1916
LAMBERT, HENRI LOUIS. Asst. Engr., Constr. Dept., United Fruit Co., Bratsey, via Bocas del Toro, Panama.		Nov. 28, 1916
LEE, ARTHUR CARL. Asst. Chf. Engr., Southern Power Co., Charlotte, N. C.		Nov. 28, 1916
LEFFERT, DAVID LESSING. County Highway Engr., Kossuth County, Algona, Iowa.		Nov. 28, 1916
LEGG, FRANK GARDNER, JR. Asst. to State San. Engr., 621 Oakland Bldg., Lansing, Mich.		Nov. 28, 1916
LE GRAND, JOSEPH MASTELLA. Eng. Dept., Canadian Copper Co., Copper Cliff, Ont., Canada.	Jun. } Assoc. M. }	Mar. 2, 1915 Oct. 10, 1916
MACKENZIE, LEON RODERICK. Box 625, Hartington, Nebr.		Sept. 12, 1916
MCCANDLISS, LESTER CHIPMAN. Asst. Prof. of Civ. Eng., Univ. of Pittsburgh, 3732 Dawson St., Pittsburgh, Pa.		Nov. 28, 1916
MCCOLLOUGH, CHARLES ANDREW. Structural Engr., Bethle- hem Steel Co., 218 North Linden St., Bethlehem, Pa.		Nov. 28, 1916
MILLER, LORA WALTER. Asst. Engr., Chi. & W. Ind. R. R., 520 W. 72d St., Chicago, Ill.		Nov. 28, 1916
MITCHELL, ARTHUR KNOX. Cons. Engr., Box 3, Victoria, B. C., Canada.		Nov. 28, 1916
MURRAY, JAMES POWELL. Civ. Engr., Texas State Reclama- tion Dept., 405 East 22d St., Austin, Tex.		Nov. 28, 1916
MYERS, ERNEST LINDLEY. (Myers & Noyes), 405 Juanita Bldg., Dallas, Tex.		Nov. 28, 1916
NOLAN, QUINCES ROBERTUS. Res. Engr., Hill- side Cotton Mills, La Grange, Ga.	Jun. } Assoc. M. }	May 6, 1914 Nov. 28, 1916
RIGHTMIRE, CLAUDE HENRY. Asst. and Res. Engr., Palm Beach County, on Constr. of Roads and Bridges, Stuart, Fla.		Nov. 28, 1916
RUFF, EDWARD JOHN. 832 Centennial Ave., Sewickley, Pa.		Oct. 10, 1916

ASSOCIATE MEMBERS (*Continued*)

		Date of Membership.
SANDELANDS, EDWARD BURCHARD. 3106 Ave. R., Galveston, Tex.....	Jun. } Assoc. M.	May 7, 1913 Nov. 28, 1916
SEWELL, HAROLD ARTHUR. County Engr., Pend Oreille County, Newport, Wash.....		Nov. 28, 1916
SHAFFER, ERNEST ALTON. Asst. Engr., Eng. Corps, Dept. of Public Lands, State of Washington, Box 703, Olympia, Wash.....		Nov. 28, 1916
SOO-HOO, PETER. Engr., Section 16, Kwong Tung Yueh-Han Ry., 52 Great Yan Tsai St., Canton, China.....	Jun. } Assoc. M.	Jan. 31, 1911 Sept. 12, 1916
SOURWINE, JAMES ARTHUR. County Engr., San Bernardino County; Cons. Hydr. Engr. (Sourwine & Mahoney), San Bernardino, Cal.....		June 23, 1916
THACKWELL, HENRY LAWRENCE. Chf. Engr. and Mgr., The Uinta County Irrig. Co., Marbleton, Wyo.....	Jun. } Assoc. M.	Dec. 3, 1912 Nov. 28, 1916
TOYNE, JOHN WILSON. Chf. Engr. and Supt., South Bend City Water-Works, 815 Ashland Ave., South Bend, Ind.....		Nov. 28, 1916
WASHBURN, CHARLES EMMETT. Office Engr., The Benham Engr. Co., 13th Floor, Colcord Bldg., Oklahoma, Okla.		Nov. 28, 1916
WRIGHTON, WILLIAM DAUGHERTY. San. Engr. U. S. Public Health Service, The Highlands Apartments, Wash- ington, D. C.....		Nov. 28, 1916

ASSOCIATES

CHURCH, HOWARD EMERSON. Purchasing Agt., Fred T. Ley & Co., Inc., Box 255, Springfield, Mass.....	Sept. 12, 1916
--	----------------

JUNIORS

BREALY, RAYMOND FIELDING. Eng. Draftsman, Harbor Dept., Bureau of Constr. and Maintenance, City of Los Angeles, Room 17, City Hall, San Pedro, Cal....	Nov. 28, 1916
CHIN, KEE HAM. 508 Seventh Ave., South, Seattle, Wash..	Nov. 28, 1916
CONWAY, CLARENCE DEXTER. Supt. and Engr., Los Molinos Land Co., Los Molinos, Cal.....	Nov. 28, 1916
COTTER, CARL HENRY. Structural Draftsman, Mt. Vernon Bridge Co., 104 East Vine St., Mt. Vernon, Ohio....	Nov. 28, 1916
DEDICKE, ERNEST CHARLES. Troop G, 1st New York Cav- alry, McAllen, Tex.....	Nov. 28, 1916
DE MOSS, SAMUEL. Tapeman, N. P. Ry., 1750 West 59th St., Seattle, Wash.....	Nov. 28, 1916
EVERETT, RALPH BURROWS. Care, Knoxville Power Co., Alcoa, Tenn.....	Nov. 28, 1916
GUNTHER, HERMAN DIETRICH. P. O. Box 423, Dover, N. J..	Oct. 10, 1916

JUNIORS (Continued)

	Date of Membership.
HAVENS, WILLIAM LOUIS. 12319 Osceola Ave., Cleveland, Ohio.....	Oct. 10, 1916
KOHL, FRANK EDWARD, JR. 350 East 200th St., New York City.....	Nov. 28, 1916
MILKOWSKI, VICTOR JOHN. Engr. of Constr. and Asst. to Dredging Engr., Morris Machine Works, Baldwins- ville, N. Y.....	Nov. 28, 1916
PRACK, ARTHUR EDWARD. Gen. Supt. of Constr., Prack & Perrine, 809 Crucible St., Pittsburgh, Pa.....	Nov. 28, 1916
ROGERS, LESTER CUSHING. Asst. Engr., Bates & Rogers Constr. Co., 148 Engrs. Bldg., Cleveland, Ohio.....	Nov. 28, 1916
STEINBERG, MAXIMILIAN. Asst. Engr., U. S. Coast and Geodetic Survey, Washington, D. C.....	Sept 12, 1916

RESIGNATIONS

MEMBERS

	Date of Resignation.
BALDWIN, GEORGE PORTER.....	Dec. 31, 1916
BOYD, WILLIAM CHARLES.....	Dec. 31, 1916
CARTER, RICHARD WILLIAM.....	Dec. 31, 1916
DABNEY, THOMAS GREGORY.....	Dec. 31, 1916
FITCH, CHARLES HALL.....	Dec. 31, 1916
HOFFMAN, NATHANIEL BAKER KLINK.....	Dec. 31, 1916
LYON, HENRY LLOYD.....	Dec. 31, 1916
NEHER, FRANK.....	Dec. 31, 1916
PHILLIPS, FREDERICK.....	Dec. 31, 1916
POTTER, HERBERT LEROY.....	Dec. 31, 1916
RIGHTER, ADDISON ALEXANDER.....	Dec. 31, 1916
ROGGE, JOHN CHARLES LEWIS.....	Dec. 31, 1916
SILLS, JOHN MUIR.....	Dec. 31, 1916
TOLL, ROGER WOLCOTT.....	Dec. 31, 1916

ASSOCIATE MEMBERS

BELCHER, DONALD MINOR.....	Dec. 31, 1916
BROWN, GEORGE ROWELL.....	Dec. 31, 1916
CARLISLE, ORVILLE BERTON.....	Dec. 31, 1916
COE, ROBERT.....	Dec. 31, 1916
Craven, JAY ALLEN.....	Dec. 31, 1916
ELLIS, LAWRENCE REES.....	Dec. 31, 1916
GILES, ARTHUR LEONARD.....	Dec. 31, 1916
HARDIN, ABRAHAM TRACY.....	Dec. 31, 1916
HELVERN, DAN EDWIN.....	Dec. 31, 1916
HENDRICK, EDWARD PIERSON.....	Dec. 31, 1916
HIGHLEY, LEE.....	Dec. 31, 1916
JACKMAN, ANDREW WILLIAM.....	Dec. 31, 1916

ASSOCIATE MEMBERS (*Continued*)

	Date of Resignation.
KIRKPATRICK, RALPH ZENAS.....	Dec. 31, 1916
LINARD, DREW JONES.....	Dec. 31, 1916
LOGAN, HAL HELM.....	Dec. 31, 1916
NELSON, OSCAR BENJAMIN.....	Dec. 31, 1916
NEWBEGIN, PARKER CLEAVELAND.....	Dec. 31, 1916
O'HARA, JOSEPH MATTHEW.....	Dec. 31, 1916
PIERCE, THOMAS DAY.....	Dec. 31, 1916
REEL, CHARLES GORDON.....	Dec. 31, 1916
RENSHAW, ROBERT HENRY, JR.....	Dec. 31, 1916
SAUNDERS, FRANK WILLIAM.....	Dec. 31, 1916
THORNTON, JOHN EDWARD.....	Dec. 31, 1916
TREADWELL, WILLIAM ADAMS.....	Dec. 31, 1916
TUNSTALL, WHITMELL PUGH.....	Dec. 31, 1916
VANNEMAN, CHARLES REEVE.....	Dec. 31, 1916
WOODSON, LEROY.....	Dec. 31, 1916

ASSOCIATES

DOUTY, DANIEL ELLIS.....	Dec. 31, 1916
--------------------------	---------------

JUNIORS

BENDEL, JACOB.....	Dec. 31, 1916
BRADSTREET, HERBERT NEAL.....	Dec. 31, 1916
BRUSH, CHARLES BENJAMIN.....	Dec. 31, 1916
CREWE, REXFORD.....	Dec. 31, 1916
CUTLER, STANLEY GARDNER.....	Dec. 31, 1916
DENNIE, FRANK EDWARD.....	Dec. 31, 1916
LEHMAN, HENRY MARON.....	Dec. 31, 1916
MORRISON, WILLIAM HARRISON, JR.....	Dec. 31, 1916
WILSON, CALVIN LOUGHBRIDGE.....	Dec. 31, 1916

DEATHS

- ANSON, WILLIAM FREDERICK ALFRED. Elected Associate Member, October 1st, 1912; died July 17th, 1916.
- BIGELOW, EDWARD MANNING. Elected Member, December 4th, 1889; died December 6th, 1916.
- MCCOOL, DANIEL. Elected Member, September 5th, 1883; died December 1st, 1916.
- PARKER, HAROLD. Elected Member, June 7th, 1899; died November 29th, 1916.
- RAMSEY, JOSEPH. Elected Member, May 1st, 1889; died July 7th, 1916.
- ROHRER, GRANT. Elected Member, July 1st, 1909; died December 12th, 1916.
- TAPPAN, ROGER. Elected Junior, December 3d, 1884; died December 6th, 1916.
- VANSITTART, GEORGE EDWARD. Elected Associate Member, March 5th, 1912; died May 14th, 1916.

VON LEER, ISAAC WAYNE. Elected Member, May 3d, 1899; died November 23d, 1916.

WESTON, EDMUND BROWNELL. Elected Member, December 6th, 1882; died December 9th, 1916.

WHITE, DAVID MILLER. Elected Associate Member, November 8th, 1909; died October 29th, 1916.

**Total Membership of the Society, January 4th, 1917,
8 194.**

MONTHLY LIST OF RECENT ENGINEERING ARTICLES OF INTEREST

(December 4th, 1916, to January 1st, 1917)

NOTE.—This list is published for the purpose of placing before the members of this Society, the titles of current engineering articles, which can be referred to in any available engineering library, or can be procured by addressing the publication directly, the address and price being given wherever possible.

LIST OF PUBLICATIONS

In the subjoined list of articles, references are given by the number prefixed to each journal in this list:

- | | |
|---|---|
| (2) <i>Proceedings</i> , Engrs. Club of Phila., Philadelphia, Pa. | (30) <i>Annales des Travaux Publics de Belgique</i> , Brussels, Belgium, 4 fr. |
| (3) <i>Journal</i> , Franklin Inst., Philadelphia, Pa., 50c. | (31) <i>Annales de l'Assoc. des Ing. Sortis des Ecoles Spéciales de Gand</i> , Brussels, Belgium, 4 fr. |
| (4) <i>Journal</i> , Western Soc. of Engrs., Chicago, Ill., 50c. | (32) <i>Mémoires et Compte Rendu des Travaux</i> , Soc. Ing. Civ. de France, Paris, France. |
| (5) <i>Transactions</i> , Can. Soc. C. E., Montreal, Que., Canada. | (33) <i>Le Génie Civil</i> , Paris, France, 1 fr. |
| (6) <i>School of Mines Quarterly</i> , Columbia Univ., New York City, 50c. | (34) <i>Portefeuille Economiques des Machines</i> , Paris, France. |
| (7) <i>Gesundheits Ingenieur</i> , München, Germany. | (35) <i>Nouvelles Annales de la Construction</i> , Paris, France. |
| (8) <i>Stevens Institute Indicator</i> , Hoboken, N. J., 50c. | (36) <i>Cornell Civil Engineer</i> , Ithaca, N. Y. |
| (9) <i>Engineering Magazine</i> , New York City, 25c. | (37) <i>Revue de Mécanique</i> , Paris, France. |
| (11) <i>Engineering</i> (London), W. H. Wiley, 432 Fourth Ave., New York City, 25c. | (38) <i>Revue Générale des Chemins de Fer et des Tramways</i> , Paris, France. |
| (12) <i>The Engineer</i> (London), International News Co., New York City, 35c. | (39) <i>Technisches Gemeindeblatt</i> , Berlin, Germany, 0, 70m. |
| (13) <i>Engineering News</i> , New York City, 15c. | (40) <i>Zentralblatt der Bauverwaltung</i> , Berlin, Germany, 60 pfg. |
| (14) <i>Engineering Record</i> , New York City, 15c. | (41) <i>Electrotechnische Zeitschrift</i> , Berlin, Germany. |
| (15) <i>Railway Age Gazette</i> , New York City, 15c. | (42) <i>Proceedings</i> , Am. Inst. Elec. Engrs., New York City, \$1. |
| (16) <i>Engineering and Mining Journal</i> , New York City, 15c. | (43) <i>Annales des Ponts et Chaussées</i> , Paris, France. |
| (17) <i>Electric Railway Journal</i> , New York City, 10c. | (44) <i>Journal</i> , Military Service Institution, Governors Island, New York Harbor, 50c. |
| (18) <i>Railway Review</i> , Chicago, Ill., 15c. | (45) <i>Coal Age</i> , New York City, 10c. |
| (19) <i>Scientific American Supplement</i> , New York City, 10c. | (46) <i>Scientific American</i> , New York City, 15c. |
| (20) <i>Iron Age</i> , New York City, 20c. | (47) <i>Mechanical Engineer</i> , Manchester, England, 3d. |
| (21) <i>Railway Engineer</i> , London, England, 1s. 2d. | (48) <i>Zeitschrift</i> , Verein Deutscher Ingenieure, Berlin, Germany, 1, 60m. |
| (22) <i>Iron and Coal Trades Review</i> , London, England, 6d. | (49) <i>Zeitschrift für Bauwesen</i> , Berlin, Germany. |
| (23) <i>Railway Gazette</i> , London, England, 6d. | (50) <i>Stahl und Eisen</i> , Düsseldorf, Germany. |
| (24) <i>American Gas Light Journal</i> , New York City, 10c. | (51) <i>Deutsche Bauzeitung</i> , Berlin, Germany. |
| (25) <i>Railway Mechanical Engineer</i> , New York City, 20c. | (52) <i>Rigasche Industrie-Zeitung</i> , Riga, Russia, 25 kop. |
| (26) <i>Electrical Review</i> , London, England, 4d. | (53) <i>Zeitschrift</i> , Oesterreichischer Ingenieur und Architekten Verein, Vienna, Austria, 70h. |
| (27) <i>Electrical World</i> , New York City, 10c. | (54) <i>Transactions</i> , Am. Soc. C. E., New York City, \$12. |
| (28) <i>Journal</i> , New England Water-Works Assoc., Boston, Mass., \$1. | (55) <i>Transactions</i> , Am. Soc. M. E., New York City, \$10. |
| (29) <i>Journal</i> , Royal Society of Arts, London, England, 6d. | (56) <i>Transactions</i> , Am. Inst. Min. Engrs., New York City, \$8. |

- (57) *Colliery Guardian*, London, England, 5d.
 (58) *Proceedings*, Engrs.' Soc. W. Pa., 2511 Oliver Bldg., Pittsburgh, Pa., 50c.
 (59) *Proceedings*, American Water-Works Assoc., Troy, N. Y.
 (60) *Municipal Engineering*, Indianapolis, Ind., 25c.
 (61) *Proceedings*, Western Railway Club, 225 Dearborn St., Chicago, Ill., 25c.
 (62) *Steel and Iron*, Thaw Bldg., Pittsburgh, Pa., 10c.
 (63) *Minutes of Proceedings*, Inst. C. E., London, England.
 (64) *Power*, New York City, 5c.
 (65) *Official Proceedings*, New York Railroad Club, Brooklyn, N. Y., 15c.
 (66) *Journal of Gas Lighting*, London, England, 6d.
 (67) *Cement and Engineering News*, Chicago, Ill., 25c.
 (68) *Mining Journal*, London, England, 6d.
 (69) *Der Eisenbau*, Leipzig, Germany.
 (71) *Journal*, Iron and Steel Inst., London, England.
 (71a) *Carnegie Scholarship Memoirs*, Iron and Steel Inst., London, England.
 (72) *American Machinist*, New York City, 15c.
 (73) *Electrician*, London, England, 18c.
 (74) *Transactions*, Inst. of Min. and Metal., London, England.
 (75) *Proceedings*, Inst. of Mech. Engrs., London, England.
 (76) *Brick*, Chicago, Ill., 20c.
 (77) *Journal*, Inst. Elec. Engrs., London, England, 5s.
 (78) *Beton und Eisen*, Vienna, Austria, 1, 50m.
 (79) *Forscheraarbeiten*, Vienna, Austria.
 (80) *Tonindustrie Zeitung*, Berlin, Germany.
 (81) *Zeitschrift für Architektur und Ingenieuresen*, Wiesbaden, Germany.
 (82) *Mining and Engineering World*, Chicago, Ill., 10c.
 (83) *Gas Age*, New York City, 15c.
 (84) *Le Ciment*, Paris, France.
 (85) *Proceedings*, Am. Ry. Eng. Assoc., Chicago, Ill.
 (86) *Engineering-Contracting*, Chicago, Ill., 10c.
 (87) *Railway Engineering and Maintenance of Way*, Chicago, Ill., 10c.
 (88) *Bulletin of the International Ry. Congress Assoc.*, Brussels, Belgium.
 (89) *Proceedings*, Am. Soc. for Testing Materials, Philadelphia, Pa., \$5.
 (90) *Transactions*, Inst. of Naval Archts., London, England.
 (91) *Transactions*, Soc. Naval Archts. and Marine Engrs., New York City.
 (92) *Bulletin*, Soc. d'Encouragement pour l'Industrie Nationale, Paris, France.
 (93) *Revue de Métallurgie*, Paris, France, 4 fr. 50.
 (95) *International Marine Engineering*, New York City, 20c.
 (96) *Canadian Engineer*, Toronto, Ont., Canada, 10c.
 (98) *Journal*, Engrs. Soc. Pa., Harrisburg, Pa., 30c.
 (99) *Proceedings*, Am. Soc. of Municipal Improvements, New York City, \$2.
 (100) *Professional Memoirs*, Corps of Engrs., U. S. A., Washington, D. C., 50c.
 (101) *Metal Worker*, New York City, 10c.
 (102) *Organ für die Fortschritte des Eisenbahnwesens*, Wiesbaden, Germany.
 (103) *Mining and Scientific Press*, San Francisco, Cal., 10c.
 (104) *The Surveyor and Municipal and County Engineer*, London, England, 6d.
 (105) *Metallurgical and Chemical Engineering*, New York City, 25c.
 (106) *Transactions*, Inst. of Min. Engrs., London, England, 6s.
 (107) *Schweizerische Bauzeitung*, Zürich, Switzerland.
 (108) *Iron Tradesman*, Atlanta, Ga., 10c.
 (109) *Journal*, Boston Soc. C. E., Boston, Mass., 50c.
 (110) *Journal*, Am. Concrete Inst., Philadelphia, Pa., 50c.
 (111) *Journal of Electricity, Power and Gas*, San Francisco, Cal., 25c.
 (112) *Internationale Zeitschrift für Wasser-Versorgung*, Leipzig, Germany.
 (113) *Proceedings*, Am. Wood Preservers' Assoc., Baltimore, Md.
 (114) *Journal*, Institution of Municipal and County Engineers, London, England, 1s. 6d.
 (115) *Journal*, Engrs.' Club of St. Louis, St. Louis, Mo., 35c.
 (116) *Blast Furnace and Steel Plant*, Pittsburgh, Pa., 15c.

LIST OF ARTICLES

Bridges.

- The Cherry Street Bridge, Toledo, Ohio.* Clement E. Chase, Jun. Am. Soc. C. E. (54) Vol. 80, 1916.
 The Picaza Bridge.* A. A. Agramonte, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Temperature Stresses in a Series of Spans.* Tresham D. Gregg, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Twelfth Street Trafficway Viaduct, Kansas City, Missouri.* E. E. Howard, M. Am. Soc. C. E. (54) Vol. 80, 1916.

* Illustrated.

Bridges—(Continued).

- Ferro-Concrete Bridges on the Meuse.* (104) Nov. 24.
 Conferences and Commission Rulings Following Boston Drawbridge Accident.* (17) Nov. 25.
 Complex Grade Changes in a Highway Bridge.* (13) Nov. 30.
 The Portland Bridge.* Eugene E. Pettee. (109) Dec.
 Extensograph Shows That Bridge Leans to Side.* (13) Dec. 7.
 Charts for Eccentric Loading on Rectangular Areas.* S. M. Cotten. (13) Dec. 7.
 Raising a Bridge by Levers When Jacks Failed.* W. T. Penney. (13) Dec. 7.
 Approaches of Bloor Street Viaduct, Toronto, Have Concrete-Covered Steel Frames.* W. F. B. Rubidge. (14) Dec. 9.
 Girders Act as Railing in Overhead Crossing. (14) Dec. 9.
 Light Timber Mast Used in Repairing Bascul Bridge.* (14) Dec. 9.
 Susquehanna River Bridge of the Cumberland Valley R. R. at Harrisburg, Pa.* (18) Dec. 9.
 Completing the Municipal Bridge at St. Louis, Mo.* (13) Dec. 14.
 Ten-Span Concrete-Arch Bridge Near Columbus, Ohio.* E. P. Knollman. (13) Dec. 14.
 Barrel Pontoon Footbridge Built at Cost of \$75.* (14) Dec. 16.
 Timber-Incased Concrete Caisson to be Sunk 142 Ft. for New London Bridge.* (14) Dec. 16.
 Erecting and Swinging 720-Ft. Span of Metropolis Bridge.* (13) Dec. 21.
 Special Details in Erection Reduce Secondary Stresses in Longest Simple Trusses. (14) Dec. 23.
 Changes in General Specifications for Bridge Work of Illinois State Highway Department. (86) Dec. 27.
 Detailed Cost of 113-Ft. Reinforced Concrete Through Girder Bridge Built Near Douglas, Ariz. Lamar Cobb. (From Annual Report of State Engr.) (86) Dec. 27.
 Some Interesting Examples of European Concrete Bridge Designs.* Albert M. Wolf. (86) Dec. 27.
 Comparative Costs of Steel and Concrete Bridges. A. W. Conover. (From *Illinois Highways*.) (86) Dec. 27.
 Contractor Discusses Bridges Damaged by Flood. (13) Dec. 28.
 New Type of Concrete Floor on St. Louis Bridge.* (13) Dec. 28.
 Inlaid Tile Used in Arch Span of Park Bridge.* (14) Dec. 30.
 Ponts Basculants Système Scherzer et Système Cuvellier.* (33) Dec. 2.

Electrical.

- Apparatus for the Measurement of Electric Resistance of Material in the Solid State at High Temperatures, and Its Application to the Determination of the Critical Points of Iron and Steel.* P. Saldau. (71a) Vol. 7.
 Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators.* Benjamin F. Groat, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Automatic Telephone.* E. L. Grauel. (98) Oct.
 Linking-Up Electric Power Stations. (26) Nov. 17.
 New Electricity Works at Walsall.* (73) Nov. 24.
 Standardization of Switchgear and Instrument Connections.* Charles C. Garrard. (73) Nov. 24.
 Singer Plant at South Bend.* Thomas Wilson. (64) Dec. 19.
 The Theory of Armature Windings.* S. P. Smith. (77) Dec.
 Rupturing Capacities of Oil Circuit Breakers. Stephen Q. Hayes. (42) Dec.
 Rating of Oil Circuit Breakers. E. M. Hewlett. (42) Dec.
 Theoretical Discussion of the Audion.* Marius Latour. (73) Dec. 1.
 Clyde Valley Co.'s New Cambuslang Power Station.* (26) Dec. 1.
 Influence of the Time Element on the Resistance of a Solid Rectifying Contact.* David Owen. (Abstract of paper read before Physical Soc. of London.) (73) Dec. 1.
 Operation of the Pasadena, California, Municipal Plant.* (64) Dec. 5.
 Safety-First Starting Apparatus for Electric Motors.* A. P. Danz. (64) Dec. 5.
 On the Manufacture and Testing of Prismatic Compasses. F. E. Smith. (Abstract of paper read before the Optical Society.) (73) Dec. 8.
 Machine Trenching for Long Telephone Conduits.* (13) Dec. 7.
 Cost of Swedish State Electricity. (11) Dec. 8.
 Operating Characteristics of Lead Accumulators.* J. H. Tracy. (Abstract of paper in the *Electric Journal*.) (73) Dec. 8.
 Grading of Starting Resistances for Series Motors and for Series-Parallel Control. F. T. Chapman. (73) Dec. 8.
 Lighting a Church of the Basilica Type.* (Abstract of an article in the *Electrical Review and Western Electrician*.) (73) Dec. 8.
 Design of Direct-Current Railway Accelerating Resistors.* L. J. Hibbard. (From *Electric Journal*.) (73) Dec. 8.
 A Wehnelt Cathode-Ray Tube Magnetometer. Charles T. Knipp. (Abstract of paper in the *Philosophical Magazine*.) (73) Dec. 8.

* Illustrated.

Electrical—(Continued).

- The Pilotron Oscillator for Extreme Frequencies. William C. White. (Abstract of an article in *General Electric Review*.) (73) Dec. 8.
 Changes that Increase Denver's Electrical Distribution Facilities.* D. C. McClure. (27) Dec. 9.
 Ground Detector Developed by Pacific Coast Company.* George E. Armstrong. (27) Dec. 9.
 Converting Pin-Type to Suspension-Type Line.* George H. Stockbridge. (27) Dec. 9.
 Street Lighting Revenues in New England District. John West. (Paper read before National Electric Light Assoc.) (27) Dec. 9.
 Locating Faults in Alternating-Current Induction Motors.* (64) Dec. 12.
 Passing of the Harrison Street Station, Chicago.* A Bement. (64) Dec. 12.
 The Alexanderson Magnetic Amplifier.* Alexanderson and S. P. Nixdorff. (From Institute of Radio-Engrs.) (73) Dec. 15.
 The Sperry Searchlight.* (73) Dec. 15.
 Cost and Results of Appliance and House Wiring Campaigns in Town of 5 000. (27) Dec. 16.
 New Portable Accumulator. C. Mayfield. (From *English Mechanic*.) (19) Dec. 16.
 New Method for the Measurement of the Dielectric Constant.* J. Parker Van Zandt. (111) Dec. 16.
 Outdoor High-Tension Arrangements and Construction.* M. M. Samuels. (27) Dec. 16.
 Lightning Protection of Electrical Systems. E. G. Newton. (17) Dec. 16.
 Securing Power Business. W. C. Durant. (Paper read before the National Electric Light Assoc.) (27) Dec. 16.
 The Sinusoidal Wave Method of Radio-Telegraphy.* Walter Haynes. (111) Dec. 16.
 Control of Electric Motors in Steel Mills.* H. F. Stratton. (Paper read before Assoc. of Iron and Steel Elec. Engrs., Philadelphia Section.) (116) Dec.
 Air Delivery Factors of Blowing Engines.* W. Trinks. (116) Dec.
 Uniflow Engines as Rolling Mill Drives.* W. Trinks. (Paper read before Assoc. of Iron and Steel Elec. Engrs.) (116) Dec.
 Straightening Consumers' Load Curves.* J. E. Bullard. (27) Dec. 23.
 Wireless Telephony.* Walter Haynes. (111) Dec. 23.
 Illumination of Liberty.* R. F. Carbutt and H. H. Magdick. (27) Dec. 23.
 Maximum Demand Rates for Large Down-Town Buildings. W. P. Whittington. (27) Dec. 23.
 Practical Talks on Controllers—Current Limit Type.* M. D. Goodman. (64) Dec. 26.
 George Peabody College Power Plant.* James H. Browne. (64) Dec. 26.
 Installation of a 13 000-Foot Submarine Power Transmission Cable. (From *Pacific Service Magazine*.) (96) Dec. 28.
 Graphical Design of Direct Current Busbars.* B. B. Hood. (27) Dec. 30.
 Plant Arrangements that Permit Continuous Production Flow.* H. S. Stewart. (27) Dec. 30.
 New Power Station of Compact Design.* (17) Dec. 30.
 Neuer Stangensockel aus armiertem Beton für elektrische Freileitungen.* A. Burri. (107) Dec. 9.

Marine.

- German Way of Loading and Discharging Cargo.* H. H. Broughton. (73) Nov. 24.
 Donald Portable Sling Elevator-Conveyor.* G. F. Zimmer. (11) Nov. 24.
 German Torpedo Craft in the War.* (12) Dec. 8.
 Bethlehem Ore Docks in New York Harbor: Features of the Hulett and Mead Morrison Unloaders Provided to Serve the Various Classes of Ocean-Going Vessels.* (20) Dec. 14.
 Geared Turbine Installation for the S. S. *City of Canton*.* (11) Serial beginning Dec. 15.
 The Naval War and the Size of Battleships. William Hovgaard. (11) Serial beginning Dec. 15.
 Sur la Résistance des Coques Sous-Marines.* M. Zack. (33) Dec. 16.

Mechanical.

- Astoria Tunnel under the East River for Gas Distribution in New York City.* John Vipond Davies, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Concrete-Lined Oil-Storage Reservoirs in California: Construction Methods and Cost Data.* E. D. Cole, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Four-Cylinder Double-Acting Gas Engine.* (11) Nov. 17.
 Equipment of the Valleyfield Colliery.* (57) Nov. 17.
 American Petrol Excavators and Tractors.* (11) Nov. 17.
 Benzol Extraction on Coke Ovens. G. T. Purves. (Abstract from paper read before Scottish Junior Gas Assoc.) (57) Nov. 17.
 Oxide of Iron Purification in California. (Paper read before Pacific Coast Gas Assoc.) (66) Nov. 21.

* Illustrated.

Mechanical—(Continued).

- Oil-Washing of Gas and Matters Arising Therefrom. W. Doig Gibb and H. O. Carr. (Paper read before Southern District Assoc. of Gas Engrs. and Managers.) (66) Nov. 21.
- Removal of Sulphur from Spent Oxide. Edward J. Murphy. (Paper read before Am. Gas Inst.) (66) Nov. 21.
- Chamber Ovens in Medium-Sized Works. H. W. Douglas. (Paper read before Michigan Gas Assoc.) (66) Nov. 21.
- Equivalent of the Observed Heat Value of the Light Oil Scrubbed from Coke Oven Gases. J. W. Shaeffer. (Paper read before Am. Gas Inst.) (66) Nov. 21.
- Economy of Coal in Power Production. C. E. Stromeyer. (From Manchester Steam Users' Assoc.) (47) Nov. 24.
- Coal Loading Conveyors.* (57) Nov. 24.
- Texture of Firebricks. J. W. Mellor. (From paper read before Faraday Soc.) (57) Nov. 24.
- Prevention of Crane Accidents. F. H. Elam. (Paper read before National Safety Council.) (47) Nov. 24.
- Steel Gasholder Tanks.* R. J. Milbourne. (66) Nov. 28.
- A Problem in Supply (Gas). John Mackensie. (66) Nov. 28.
- Unnoticed Action of Bog Iron Ore. Norton H. Humphreys. (66) Nov. 28.
- Some Points in Connection with Benzol Recovery. J. A. Wilson. (Paper read before Coke-Oven Managers' Assoc.) (66) Nov. 28.
- Roll-Neck Lubricants: Their Reclamation. William M. Davis. (From *Lubrication*.) (116) Dec.
- Condensation Pumps: An Improved Form of High Vacuum Pump.* Irving Langmuir. (3) Dec.
- Automobile Engines of the Future—Will They Operate on the Otto or Some Other Cycle? Herbert Clare. (2) Dec.
- Some Whole Truths Regarding the Constant Pressure Cycle. Arthur B. Browne and Herbert Chase. (2) Dec.
- Purification of Boiler Feed Water.* (67) Dec.
- Oil Fuel in New England.* Charles H. Bromley. (64) Dec.
- Progress with the Internal Combustion Engine. (11) Dec. 1.
- How Old Metal is Reclaimed in a Large Plant. J. M. Bateman. (Paper read before Am. Inst. of Metals.) (47) Dec. 1.
- Springs.* C. E. Squire. (Paper read before Junior Inst. of Engrs.) (47) Serial beginning Dec. 1.
- Commercial Motor Vehicles for Railway and Industrial Purposes.* (23) Dec. 1.
- Can Foundry Sand Be Recovered Economically? H. B. Swan. (Paper read before Am. Foundrymen's Assoc.) (47) Dec. 1.
- Sheet-Steel Gear Cases.* C. W. Squier. (17) Dec. 2.
- Distribution of Combustion Products from Inverted Gas Lamps.* Robert Ffrench Pierce. (24) Dec. 4.
- For Some Purposes Heat of Connection is More Desirable than Radiant Heat. L. J. Platt. (Abstract of paper read before National Commercial Gas Assoc.) (24) Dec. 4; Dec. 11.
- Internal-Combustion Turbine.* A. W. H. Grieve. (64) Dec. 5.
- Pressure Tests of Welded Boiler-Tube Vessel.* Robert Cramer. (64) Dec. 5.
- Finding a Market for Culls.* Curtis A. Wessel. (76) Dec. 5.
- Maintenance Cost of Automobiles. (86) Dec. 6.
- Efficient Formed-Tool Grinding.* J. B. Murphy. (72) Dec. 7.
- Special Lathes for 8-In. Shells.* H. V. Haight. (72) Dec. 7.
- Book on the Looks and Details of Machines.* John E. Sweet. (72) Serial beginning Dec. 7.
- New Iron and Steel Roll Foundry.* (Birdsboro, Pa.) (20) Dec. 7.
- Installing Sugar Machinery in Hawaii.* (72) Dec. 7.
- Making of the Annular Type of Ball Bearings.* (72) Dec. 7.
- Youngstown's New Coke Oven Plant.* (20) Dec. 7.
- Three Departments in a Typewriter Factory.* Frank A. Stanley. (72) Dec. 7.
- Racine Electric Steel Foundry Completed.* (20) Dec. 7.
- Give Furnaces Plenty of Air for Good Work.* Ben Thur. (101) Dec. 8.
- Russian Motor Car Requirements. (23) Dec. 8.
- Tightening Coke Oven Doors.* (57) Dec. 8.
- Calculation of Flow of Steam Through Pipes. Frederick N. Hatch. (27) Dec. 9.
- Boiler Settings Under Different Conditions.* (27) Dec. 9.
- Modern Practice in Fuel Briquetting.* W. P. Frey. (45) Dec. 9.
- Byproduct Coke Ovens on Jersey Meadows Built Inside Temporary Steel Sheds.* (14) Dec. 9.
- Gas Coke Has Decided Advantages Over All Other Household Fuels.* Herbert E. Birch. (24) Dec. 11.
- Value of Gas Not Determined by Competitive Cost of Other Fuels, but by Its Degree of Usefulness. Henry O. Loebell. (Paper read before National Commercial Gas Assoc.) (24) Dec. 11.
- Davis Furnace Display in Manchester.* (66) Dec. 12.

* Illustrated.

Mechanical—(Continued).

- High Pressure Distribution at San Francisco, and the Best Form of Chamber for District Regulation.* D. E. Keppelmann. (Abstract of paper read before Pacific Coast Gas and Electric Company.) (66) Dec. 12.
- Modern Gas Equipment for Residence Lighting. M. A. Combs. (Abstract of paper read before Illuminating Eng. Soc.) (66) Dec. 12.
- Visit to the Nechells (Birmingham) Gas Works (Description). E. W. Smith. (From Midland Junior Gas Assoc.) (66) Dec. 12.
- Testing Centrifugal Pumps.* J. Lewis. (64) Dec. 12.
- Experiences in Sulphate of Ammonia Making at Galashiels. R. J. Gavin. (Paper read before Scottish Junior Gas Assoc.) (66) Dec. 12.
- Vibration in Impulse Turbines.* Eustis H. Thompson. (64) Dec. 12.
- Weathering of Gas Coals: A Five-Year Test.* Alfred H. White. (Paper read before the Michigan Gas Assoc.) (66) Dec. 12.
- Safe and Noiseless Operation of Cut Gears.* William Knight. (72) Dec. 14.
- Making Typewriter Type.* Frank A. Stanley. (72) Serial beginning Dec. 14.
- Industrial Gas Problems. Charles H. Price. (83) Dec. 15.
- Warm-Air Furnace of the Fifties.* (101) Dec. 15.
- Fixing Responsibility for Efficient Service. A. C. Howard. (83) Dec. 15.
- Notes on Piston and Small-End Lubrication in Diesel Engines. G. B. Vickers. (Abstract of paper read before Diesel Engine Users' Assoc.) (73) Dec. 15.
- Refractory Materials in South Yorkshire. W. G. Fearnside. (From paper read before Midland Institute of Mining, Civil, and Mech. Engrs.) (57) Dec. 15.
- Tests of Carbon Dioxide Recorders. (11) Dec. 15.
- Deighton's Steam Boiler.* (47) Dec. 15.
- Coke Quenching Hoppers.* R. B. Richardson and John Sieberg. (83) Dec. 15.
- Graphic Record of Auto Costs.* Stanley C. Tarrant. (83) Dec. 15.
- Cast Iron: With Special Reference to Engine Cylinders. J. Edgar Hurst. (Paper read before the Manchester Association of Engineers.) (47) Serial beginning Dec. 15.
- Gas Steam Generating Units of 6 000 H.P.* (12) Dec. 15.
- Combined Coal and Gas Firing.* (57) Dec. 15.
- Motor-Generator Set for Operating Rolling Mills.* William Knight. (27) Dec. 16.
- Filling the Salt-Seller: How Salt is Extracted From the Great Salt Lake.* Stanley Weir. (46) Dec. 16.
- Modern Practice in Mechanical Boiler Stoking. John Van Brunt. (17) Dec. 16.
- Where the Motor Truck has Displaced the Horse.* (19) Dec. 16.
- Mileage Used as Basis for Computing Depreciation (Automobiles and Motor Trucks).* Asa E. Phillips. (14) Dec. 16.
- When the Boiler Attacks the Engine. C. W. Crawford. (45) Dec. 16.
- Manufacture of Big Chains.* (19) Dec. 16.
- Coking Coal Industry in Harlan County, Kentucky. J. R. Foster. (Paper read before Kentucky Mining Institute.) (45) Dec. 16.
- Hydraulic Air-Compressor.* A. E. Chodzks. (103) Dec. 16.
- Efficiency of Compressed-Air. Theodore Simons. (16) Serial beginning Dec. 16.
- Cost of Service Forms Only Equitable Basis Upon Which to Establish Rates.* J. M. Spitzglass. (Paper read before Pacific Coast Gas Assoc.) (24) Dec. 18.
- Injurious Effects of Impurities in Boiler Feed Water. W. H. Fulweiler. (Paper read before Am. Gas Institute.) (24) Dec. 18.
- How Should Gas be Measured? R. L. Spencer. (64) Dec. 19.
- Moore Steam Turbine.* (64) Dec. 19.
- D. I. Davis Low-Temperature Compression System.* (64) Dec. 19.
- Simple Tests for Iron and Steel.* C. R. White. (72) Dec. 21.
- Cincinnati Automatic Bed-Type Millers for Quantity Manufacture. (72) Dec. 21.
- Repair Work in a Sugar Mill.* Frank A. Stanley. (72) Dec. 21.
- Locomotive Crane for Heavy Concrete-Bridge Work.* (13) Dec. 21.
- Circulation of Air in Furnace Systems.* (101) Dec. 22.
- Turntable Dump Saves Time of Motor Trucks.* (14) Dec. 23.
- New Type of Steam Motor Car.* (46) Dec. 23.
- Improvements in Air-Compressors.* (103) Dec. 23.
- Finished Artificial Mantle as Furnished To-Day Represents More Labor, Investigation, Technical Skill and Refinement of Process Than Any Other Substance Used in Manufacture of Lighting Apparatus.* Robert French Pierce. (24) Dec. 25.
- Device for Carrying off Gas Leaking from Underground Mains has Proved Effective in Preventing Injury to Trees, Greenhouse Crops, etc.* George E. Stone. (24) Dec. 25.
- True Value of Light Oil in a Gas Lies in Its Effectiveness Per Unit Volume. J. W. Shaeffer. (Paper read before Am. Gas Institute.) (24) Dec. 25.
- Methods of Purifying Boiler Feed Waters. W. H. Fulweiler. (24) Dec. 25.
- Locating Ammonia Leaks.* E. W. Miller. (64) Dec. 26.
- Water Rates of Auxiliaries.* R. Von Fabrice. (64) Dec. 26.
- Do Belts Slip as Supposed? S. B. Richey. (64) Dec. 26.
- Relationship of Boiler Heating Surface to Economizer.* M. C. Sherman. (64) Dec. 26.

* Illustrated.

Mechanical—(Continued.)

- Getting the Cost of Power. C. W. Whiting. (64) Dec. 26.
 Design and Construction Features of a Reinforced Concrete Slurry Elevator.* D. C. Findlay. (86) Dec. 27.
 Thermo-Physics of Cast Iron. Richard Moldenke. (From paper read before New England Foundrymen's Assoc.) (20) Dec. 28.
 Forging-Hammer Foundations.* Terrell Croft. (72) Dec. 28.
 Production Gages. F. H. Bogart. (72) Dec. 28.
 Building Laundry Machinery.* Frank A. Stanley. (72) Dec. 28.
 Rail Rolling Mill at Marion, Ohio.* (20) Dec. 28.
 Handling the Material in a Typewriter Factory.* Frank A. Stanley. (72) Dec. 28.
 Powdered Coal for Stationary Boiler Plants. C. W. Corning. (Abstract of paper read before Smoke Prevention Assoc.) (15) Dec. 29.
 Steam Station of Ohio State Power Company.* (27) Dec. 30.
 Uniform Contract for Sheet Metal Buyers. T. D. McCloskey. (101) Dec. 29.
 Motor Service in Constructing Grain Elevator.* (27) Dec. 30.
 Compresseur—Frein pour le Réglage de la Vitesse des Véhicules automobiles sur Routes et sur Voies Ferrées.* L. Pierre-Guedon. (33) Dec. 9.

Metallurgical.

- Deterioration of Refractory Materials With Special Reference to Open-Hearth Practice.* (Parts 1-2.) H. B. Cronshaw. (71a) Vol. 7.
 Gases Occluded in Alloy Steels.* J. W. Donaldson. (71a) Vol. 7.
 Iron-Carbon-Silicon Alloys.* J. H. Andrew. (71a) Vol. 7.
 Heat Balance of a Blast-Furnace Stove.* R. S. G. Knight. (71a) Vol. 7.
 An Investigation of Liquid Contraction in Cast Iron.* (Part 2.) George Hallstone. (71a) Vol. 7.
 Preliminary Report on the Heat Balance of Steel Furnaces.* R. S. G. Knight. (71a) Vol. 7.
 Investigation of the Relative Merits of Various Agents for the Deoxidation of Steel.* (Parts 1-2.) (71a) Vol. 7.
 Oxygen Content of Iron and Steel and Its Effect on Their Properties. (Part 2.) J. Allen Pickard. (71a) Vol. 7.
 Carbonization of Wrought Iron in Gases.* F. W. Harbord. (116) Dec.
 Accidents At Blast Furnace Plants: Their Cause and Prevention. Frederick H. Wilcox. (From *Technical Paper No. 136*, U. S. Bureau of Mines.) (47) Dec. 1.
 Improvements in Rolling Mills.* (47) Dec. 1.
 From Precipitate to Bullion.* R. R. Bryan. (103) Dec. 9.
 Metallurgical Treatment of Molybdenum Ores. Herman Fleck. (From *Colorado School of Mines Quarterly*.) (82) Dec. 9.
 The Electrolytic Oxidation of Sulfurous Acid.* M. De Kay Thompson and N. J. Thompson. (105) Dec. 15.
 Outlines for the Determination of Zinc. R. Franklin Heath. (82) Dec. 16.
 Electrolytic Refining at Trail.* T. A. Rickard. (103) Serial beginning Dec. 23.
 Iron Blast-Furnace Slags. M. A. Pauloff. (From *Journal of Soc. of Chemical Industry*.) (16) Dec. 30.
 Sulphuric Acid from Copper Smelting Gases.* E. L. Larison. (16) Dec. 30.
 La Production du Culvre aux Etats-Unis, la mine Inspiration et l'Usine de Miami (Arizona).* Ch. Dantin. (33) Nov. 18.
 L'Usine Electrosiderurgique de Latrobe (Pennsylvanie, E.-U.).* Ch. Dantin. (33) Dec. 9.

Military.

- New Military Trains—Great Indian Peninsula Railway.* (23) Dec. 1.
 Sanitation with the British Expeditionary Force in France.* N. W. Haskins. (Paper read before Institution of Sanitary Engrs.) (104) Serial beginning Dec. 8.
 Deceptive Working Limits on Munitions.* F. H. Bogart. (72) Dec. 14.
 Les Croiseurs Légers.* (33) Nov. 25.
 Les Ports français et la Guerre, Marseille.* Auguste Pawlowski. (33) Dec. 16.
 Sur la Résistance des Coques Sous-Marines.* M. Zack. (33) Dec. 16.

Mining.

- Structure of the South Staffordshire Coalfield. E. A. Newell Arber. (From paper read before South Staffordshire and Warwickshire Institute of Mining Engrs.) (106) Nov.
 Economical Production and Utilization of Power at Collieries. F. F. Malret. (From paper read before Midland Institute of Mining, Civil, and Mech. Engrs.) (106) Nov.
 Widening the Upcast Shaft at Tinsley Park Colliery. H. J. Atkinson. (From paper read before Midland Institute of Mining, Civil, and Mech. Engrs.) (106) Nov.
 Electric Winding Plant at a Yorkshire Pit.* (26) Nov. 17.

* Illustrated.

Editorial—Continued.
The American Medical Association is a body of men who are interested in the health of the people. They are not interested in the health of the few, but in the health of the many. They are not interested in the health of the rich, but in the health of the poor. They are not interested in the health of the young, but in the health of the old. They are not interested in the health of the strong, but in the health of the weak. They are not interested in the health of the healthy, but in the health of the sick. They are not interested in the health of the living, but in the health of the dead. They are not interested in the health of the body, but in the health of the mind. They are not interested in the health of the individual, but in the health of the community. They are not interested in the health of the present, but in the health of the future. They are not interested in the health of the world, but in the health of the nation. They are not interested in the health of the people, but in the health of the country. They are not interested in the health of the world, but in the health of the globe. They are not interested in the health of the world, but in the health of the universe. They are not interested in the health of the world, but in the health of the world.

Editorial—Continued.
The American Medical Association is a body of men who are interested in the health of the people. They are not interested in the health of the few, but in the health of the many. They are not interested in the health of the rich, but in the health of the poor. They are not interested in the health of the young, but in the health of the old. They are not interested in the health of the strong, but in the health of the weak. They are not interested in the health of the healthy, but in the health of the sick. They are not interested in the health of the living, but in the health of the dead. They are not interested in the health of the body, but in the health of the mind. They are not interested in the health of the individual, but in the health of the community. They are not interested in the health of the present, but in the health of the future. They are not interested in the health of the world, but in the health of the nation. They are not interested in the health of the world, but in the health of the globe. They are not interested in the health of the world, but in the health of the universe. They are not interested in the health of the world, but in the health of the world.

Editorial—Continued.
The American Medical Association is a body of men who are interested in the health of the people. They are not interested in the health of the few, but in the health of the many. They are not interested in the health of the rich, but in the health of the poor. They are not interested in the health of the young, but in the health of the old. They are not interested in the health of the strong, but in the health of the weak. They are not interested in the health of the healthy, but in the health of the sick. They are not interested in the health of the living, but in the health of the dead. They are not interested in the health of the body, but in the health of the mind. They are not interested in the health of the individual, but in the health of the community. They are not interested in the health of the present, but in the health of the future. They are not interested in the health of the world, but in the health of the nation. They are not interested in the health of the world, but in the health of the globe. They are not interested in the health of the world, but in the health of the universe. They are not interested in the health of the world, but in the health of the world.

Mining—(Continued).

- Making a Shaft Upwards.* G. Blake Walker. (Paper read before Midland Inst. of Mining, Civil and Mech. Engrs.) (22) Nov. 17.
 Pit Shaft Sinking by the Freezing Process.* (12) Nov. 24.
 Iron Ores of the Marklesburg Region.* Wallace G. Imhoff. (116) Dec.
 Boiler Economy at Mining Plants.* D. J. Jenkins. (45) Dec. 2.
 Cadogan Power Plant.* Fred Norman. (45) Dec. 2.
 Cap Lamp With New Feature.* (45) Dec. 2.
 Gaseous Mines in the Crow's Nest Pass Coal Field.* Thomas Graham. (45) Dec. 2.
 Sulphidizing Carbonate Tailings for Treatment by Oil Flotation. W. A. Scott. (82) Dec. 2.
 Daily Sampling in Square-Set Mining, Arizona. F. B. Hanchett. (82) Dec. 2.
 Hulett Unloader as Applied to the Handling of Copper Ore.* (82) Dec. 2.
 Black Sand of the Pacific Coast. Herbert Lang. (103) Dec. 2.
 Design for Auxiliary Shaft.* O. J. Pleschner. (45) Dec. 2.
 Purchase of Coal on Specifications. Frederick L. Steinhoff. (76) Dec. 5.
 Storing and Measuring Oil from a California Gusher.* George D. Roalfe. (13) Dec. 7.
 Coedely Colliery.* (22) Dec. 8.
 Tonnage Available.* (Coal.) J. F. K. Brown. (45) Serial beginning Dec. 9.
 Some Observations on Sampling.* Irving Herr. (16) Dec. 9.
 Methods of Softening and Filtering Mine Water.* M. F. Newman. (82) Dec. 9.
 Public Regulation of Coal will Prove Beneficial to the Landowner, Consumer, Mineworker and Operator. George Otis Smith and C. E. Leshner. (From paper read before Am. Mining Congress.) (24) Dec. 11; (83) Dec. 15.
 The Determination of Nickel in Iron Ores. Philip Covitz. (105) Dec. 15.
 Some Causes of Decay of Timbers in Coal Mines. J. Mitchell. (From paper read before Midland Institute of Mining, Civil, and Mech. Engrs.) (57) Dec. 15.
 New Winding Plant at Newmühl Colliery, Hamborn.* Von Hummel. (From *Glückauf*.) (57) Dec. 15.
 The Big Pine Cyanide Mill.* C. H. Dunning. (16) Dec. 16.
 Newest and Largest Giant Gold Dredge.* (111) Dec. 16.
 The Launching of the *Yuba No. 16* (Dredge). Walter S. Weeks. (103) Dec. 16.
 An Interesting Dynamometer Journal-Friction Test (For Use on Mine Cars).* (45) Dec. 16.
 Centralized Power Plant.* J. M. Poyner. (45) Dec. 16.
 New Electrical Device for Detecting Gas.* C. M. Means. (Paper read before Coal Mining Institute of America.) (45) Dec. 16.
 Laundry Flotation Machine.* B. M. Snyder. (16) Dec. 16.
 Gold in Silver Concentrate. A. J. Sale. (103) Dec. 16.
 Reduction of Stope Contours.* J. J. Bristol. (16) Dec. 16.
 Bituminous Coal Mines of Crow's Nest Pass.* (Alberta and British Columbia.) P. M. Sherwin. (45) Serial beginning Dec. 23.
 Good Results Secured in the Pittsburgh Seam. Thomas Brennan. (45) Dec. 23.
 Cache Creek Dredge, Alaska.* Sumner S. Smith. (103) Dec. 23.
 Underground Electric Mine Lighting. Letson Ballet. (82) Dec. 23.
 Electricity at the Bunker Hill & Sullivan (Mine).* Walter C. Clark. (111) Dec. 23.
 Plant of the Babilonia Gold Mines, Nicaragua.* S. M. Parker. (103) Dec. 23.
 An Automatic Tipple Near Houtzdale, Penn.* H. V. Schleffer. (45) Dec. 23.
 Analysis of Molybdenum Ores. H. Westling and Carl Andersen. (103) Dec. 23.
 A Machineless Air Compressor.* (64) Dec. 26.
 Steel Dredge Construction by Pacific Dredging Co.* (16) Dec. 30.
 Handling Mine Waters.* L. B. Smith. (Paper read before Coal Mining Institute of America.) (45) Dec. 30.
 The Wave Transmission System and Its Use in Drilling.* E. M. Weston. (16) Dec. 30.

Miscellaneous.

- Classified List of Searches Made in the Library, January, 1901, to November, 1916 (Am. Soc. of Civ. Engrs.). (54) Vol. 80, 1916.
 Address at the Annual Convention, in Pittsburgh, Pa., June 27th, 1916 (Am. Soc. of Civ. Engrs.). Clemens Herschel, President, Am. Soc. C. E. (54) Vol. 80, 1916.
 Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion.* William Cain, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Protection of our Forests.* George H. Wirt. (98) Oct.
 How to Waterproof Drawings. F. W. Salmon. (13) Nov. 30.
 Electrolytic Dissociation in Non-Aqueous Solutions. Henry Jermain Maude Creighton. (3) Dec.
 A National Department of Public Works our Nation's Need. Isham Randolph. (3) Dec.
 Effect of Ultra Violet Light on the Eye. (73) Dec. 1.

* Illustrated.

Miscellaneous—(Continued).

- New Organization of the United States Office of Public Roads and Rural Engineering. (86) Dec. 6.
- Ontario Forest Protection System. (From Memorandum of Canadian Forestry Assoc. to Minister of Lands, Forests and Mines.) (96) Dec. 7.
- British Coal-Tar Colour Industry and Its Difficulties in Time of War. C. M. Whittaker. (29) Dec. 8.
- Manufacture of Chromates From Chromite. Harold French. (103) Dec. 9.
- Engineering Observations in the Orient.* Robert Sibley. (111) Dec. 9.
- Use of Ozone: Some of Its Applications in Chemical Research and the Industries.* (From *Chemical News*.) (19) Dec. 9.
- Raw Materials Used by the Rubber Manufacturers. B. D. Porritt. (From *Journal of Chemical Industry*.) (19) Dec. 9.
- Keeping Cost Data on Municipal Work Carried Out by Day Labor.* A. E. Foreman. (96) Dec. 14.
- Manufacturing Commercial Salt Blocks by Hydraulic Pressure.* (105) Dec. 15.
- Organization of Iron, Steel, Engineering, Shipbuilding, and Allied Industries. (47) Dec. 15.
- The Thermal and Pressure Decomposition of Pentanes and Hexanes. Gustav Egloff. (105) Dec. 15.
- Rubber. (11) Dec. 15.
- Rubber Sponge. Andrew H. King. (105) Dec. 15.
- Public Service Corporation and the Working Man. Theodore P. Shonts. (Abstract of paper read before Illinois Manufacturers' Assoc.) (17) Dec. 16.
- The Engineering Department Modernized (Norton Grinding Co., Worcester, Mass.)* H. W. Dunbar and W. E. Freeland. (20) Serial beginning Dec. 21.
- Organization of Manufacturing Plants.* A. D. C. Parsons. (From paper read before North-East Coast Institution of Engrs. and Shipbuilders.) (20) Dec. 21.
- Side Lights on Depreciation Problems of Utilities. Harry Barker. (13) Serial beginning Dec. 21.
- How Waste Paper is Treated to Make New Paper.* Thomas J. Keenan. (46) Dec. 23.
- A New Bromoil Process; An Improved Method of Producing Artistic Photographic Prints.* Walter Dearden. (19) Dec. 23.
- The Problem of X-Rays.* Frederick Soddy. (From *Science Progress*.) (19) Dec. 23.
- Collection of Data (Filing). Canadian Correspondent. (45) Dec. 30.
- The Synthesis of Caoutchouc: A Survey of Various Attempts to Produce Artificial Rubber. B. D. W. Luff. (From *Journal of Chemical Industry*.) (19) Dec. 30.
- The Government's Scientific and Engineering Work. (14) Dec. 30.
- De l'Organisation de la Recherche Scientifique en France. Henry Le Chateller. (93) May.
- La "Taylorisation" et son Application aux Conditions Industrielle de l'Après-Guerre. Félix Drouhet. (33) Nov. 25.

Municipal.

- Town Planning in Wales: With Special Reference to the Development of Hilly Sites. T. Alwyn Lloyd. (Extracts from paper read before the Town Planning Institute.) (104) Nov. 17.
- Constructing a Cut and Fill Park.* (86) Dec. 20.
- Town Planning: The Laying Out of Curves.* H. L. Seymour. (96) Dec. 21.
- How Chicago Is to Finance Traction Program (Chicago Traction and Subway Commission). (14) Dec. 30.

Railroads.

- Review of the Report of Captain Andrew Talcott, Chief Engineer, Mexico and Pacific Railroad, Eastern Division, from Vera Cruz to Mexico: Explorations, Surveys, Estimates, 1858.* Emile Low, M. Am. Soc. C. E. (54) Vol. 80, 1916.
- Gears and Side Rods in Electric Locomotives on American Railroads.* G. M. Eaton. (61) Oct. 16.
- General Track and Building Plan for Chicago Union Station Is Made Public. (14) Nov. 4.
- New Passenger Rolling-Stock—Great Southern and Western Railway.* (23) Nov. 17.
- Improvements on the Bombay, Baroda, and Central India Railway. (23) Nov. 17.
- Rotary Interlocking Block System.* (23) Nov. 24.
- Passenger Locomotive for the Caledonian Railway.* (11) Nov. 24.
- Locomotive Firebox Efficiency.* J. T. Anthony. (Paper read before Richmond Railway Club.) (47) Nov. 24.
- Classification of Railway Failures. (11) Nov. 24.
- Locomotive Axle Failure. H. W. Belnap. (From Report to Interstate Commerce Commission.) (25) Dec.
- Hopper Car of 2 000 000 Lb. Capacity.* (25) Dec.
- Handling and Repairing Freight Cars. F. C. Schultz. (Paper read before Car Inspectors' and Foremen's Assoc.) (24) Dec.

* Illustrated.

Railroads—(Continued).

- Automatic Refrigerator and Heater Car.* (25) Dec.
 Balance Draft for Stationary Boilers.* (25) Dec.
 Modern British Goods Locomotives.* E. C. Poultney. (25) Dec.
 Operation of a General Flue Shop.* R. B. Van Wormer. (Abstract of paper read before Southern and Southwestern Railway Club.) (25) Dec.
 Kiesel Train Resistance Formulas. A. J. Wood. (From Report to Am. Railway Master Mechanics' Assoc.) (25) Dec.
 High Explosives: Their History and Manufacture, and their Application to Railway and Kindred Work.* W. Cleaver. (Paper read before Permanent Way Institution.) (23) Serial beginning Dec. 1.
 Heavy 4-4-2 Type Locomotives—Pennsylvania Railway.* (23) Dec. 1.
 The Miscox Railway.* S. Berg. (12) Serial beginning Dec. 1.
 Burning out of a Tunnel on the Southern Pacific.* (23) Dec. 1.
 Belgian Engineer's Ideas of Heavy Electric Traction in America. Joseph Carlier. (From *La Lumière Electrique*.) (17) Dec. 2.
 Engine Terminal and Coach Yard, Baltimore & Ohio C. T. R. R., Chicago.* (18) Dec. 2.
 Electric Arc Welding.* (From Report to Assoc. of Railway Electrical Engrs.) (18) Dec. 2.
 Heavy Grading on 50-Mile Southern Relocation.* (13) Dec. 7.
 Unusual Flue Work and Tools in a Railroad Shop.* (72) Dec. 7.
 Sleeping Cars for the Canadian Government.* (15) Dec. 8; (25) Dec.
 Express Tank Locomotive, 4-6-4 Type—London, Brighton & South Coast Railway.* (23) Dec. 8.
 Position-Light Signals, Pennsylvania Railroad.* (23) Dec. 8.
 Louisville & Nashville Timber Treating Plant.* (15) Dec. 8.
 Steel and Wood in Freight Car Construction. (18) Dec. 9.
 Uses of Compressed Air in Railroad Shops.* (From Report to Assoc. of Railway Electrical Engrs.) (18) Dec. 9.
 To Facilitate Laying Out Sharp Railroad Curves. F. T. Howes. (14) Dec. 9.
 Piledrivers Designed and Built by Three Railways.* (13) Dec. 14.
 New Railway in Indiana for the Pennsylvania System.* (13) Dec. 14.
 Lighting Freight Yards.* (13) Dec. 14.
 The Chicago, Milwaukee & St. Paul Railway.* (From pamphlet by the General Electric Co. of Schenectady.) (73) Dec. 15.
 Fuel Economy and Locomotive Boiler Design. J. T. Anthony. (Paper read before the New England Railroad Club.) (47) Dec. 15.
 Locomotive Fire-boxes. (23) Dec. 15.
 The Electric Equipment of the Locomotives for the Chicago, Milwaukee & St. Paul Ry.* (From *General Electric Review* and *Electric Railway Journal*.) (73) Dec. 15.
 New Top-Feed Arrangement for Locomotive Boilers—London, Brighton & South Coast Railway.* (23) Dec. 15.
 Is Intercolonial's Failure Due to Low Rates? Francis A. Bonner. (15) Dec. 15.
 The Pennsylvania's Fight with the Snow.* (23) Dec. 15.
 Second Simplon Tunnel. (12) Dec. 15.
 Protest Against the Federal Valuation: Atlanta, Birmingham & Atlantic and Texas Midland Object Strongly to Many Figures in Government Report. (15) Dec. 15; (14) Dec. 16.
 Force of Impact Between Vehicles in a Moving Train of cars.* Walter V. Turner. (From *Railway and Locomotive Engineering*.) (19) Dec. 16.
 New Freight House for the Chicago & Northwestern Railway, at Sioux City, Ia.* (18) Dec. 16.
 Would Replace Atlanta's Two Passenger Terminals with One on New Site.* (14) Dec. 16.
 Arc-Welded Track Joints. E. A. Hoffman. (17) Dec. 16.
 Developments in Valuation. (18) Dec. 16.
 The Proposed Illinois Central Terminal at Chicago.* (86) Dec. 20; (15) Dec. 22.
 Analyzing a Typical Freight Car Journey: A Study of the Reasons for the Low Mileage Per Car Per Day and Measures by Which It Can be Increased.* C. F. Balch. (15) Dec. 22.
 Heavy Freight Locomotives for the Duluth, Missabe & Northern.* (15) Dec. 22.
 Rebuilding the World's Busiest Station in War Time (St. Lazare, Paris).* (15) Dec. 22.
 Signals in New South Wales. C. B. Byles. (From paper read before Electrical Assoc. of Australia.) (15) Dec. 22.
 New York Central Passenger and Freight Terminal at Buffalo.* (15) Dec. 22.
 Electric Arc Welding in Locomotive Repair Shops.* R. E. Kinkead. (18) Dec. 23.
 Government Ownership (Railroads). F. B. De Berard. (18) Serial beginning Dec. 23.
 Aluminum Catenary Messenger with Steel Contact Wire Used on L. E. & N. Ry.* (17) Dec. 30.
 Study and Comparative Tests of Electric Headlights. (17) Dec. 30.

* Illustrated.

Railroads—(Continued).

- Railway Publicity. Walter S. Thompson. (Paper read before the Canadian Railway Club.) (17) Dec. 30.
 Tunnel Sous-Main entre la France et l'Angleterre.* A. Moutiér. (32) July.
 Appareils pour la Réparation des Plaques Tubulaires des Foyers de Locomotives.* L. Pierre-Guédon. (33) Nov. 18.
 Les Résultats d'Exploitation du Chemin de Fer des Alpes bernoises (Berne-Loetschberg-Simplon).* (33) Nov. 25.
 Les Chemins de Fer russes et la Guerre; les Projets de Construction des Nouvelles Lignes. (33) Dec. 2.
 Les Chemins de Fer Chinois, Programme pour leur Développement.* P. Calfas. (33) Dec. 9.
 Die Eisenbahn-Tunnel der Schweiz von mehr als 2 000 m. Länge.* (107) Nov. 25.
 Die Druckluft-Stellwerkanlage des Bahnhofes Spliez.* W. Schaffer. (107) Dec. 9.

Railroads, Street.

- Secure Subway Supports.* A. B. Lueder, M. Am. Soc. C. E., and W. J. R. Wilson. (54) Vol. 80, 1916.
 Truss-Side Construction for Railway Cars.* L. B. Stillwell. (Abstract of paper read before Central Electric Ry. Assoc.) (17) Nov. 25.
 Freight and Express Traffic: Increased Freight and Express Service will Make Electric Railways More Useful. Nathan Rumney. (Abstract of paper read before Central Electric Railway Assoc.) (17) Dec. 2.
 Arrangement for Serving 1 500-Volt Railway.* (27) Dec. 2.
 1 500-Volt Substation with Three 750-Volt Rotaries. (Salt Lake and Utah Railway).* M. R. Lott. (17) Dec. 2.
 Interconnecting Power Supply Systems. Samuel Insull. (Paper read before Illinois Electric Railways Assoc.) (17) Dec. 2.
 Headlights: A Comprehensive Survey of the Practice and Theory of Illumination as Applied to This Phase of the Subject.* K. W. Mackall. (Abstract of paper read before Central Electric Railway Assoc.) (17) Dec. 2.
 Future of the Street Railway. Edwin F. Jones. (Paper read before New England Street Railway Club.) (17) Dec. 2.
 Cutting Out Journal Troubles on an Interurban Road.* A. Blanchard. (17) Dec. 9.
 Remodeling a Small Railway Power Plant (Holyoke Street Railway).* (17) Dec. 9.
 Some Phases of the One-Man Car Question. C. D. Cass. (Abstract of paper read before Illinois Electric Railway Assoc.) (17) Dec. 9.
 Modern Requirements Fulfilled by One-Man Cars. C. H. Beck. (Abstract of paper read before Illinois Electric Railway Assoc.) (17) Dec. 9.
 Safety Stop for Drawbridges and Grade Crossings.* J. B. Strauss. (17) Dec. 9.
 New Derailing Train Stop Tested at Boston.* (17) Dec. 9.
 Future Rapid Transit System of Chicago.* (13) Dec. 14; (17) Dec. 9; (86) Dec. 20; (17) Dec. 23.
 Equipment Details and Design of the New Rochester Car.* E. J. Cook. (17) Dec. 16.
 Regulating Voltage for Car Lighting.* (17) Dec. 16.
 Fundamentals of Traffic Routing. B. J. Arnold. (From Report to Rochester Chamber of Commerce.) (17) Dec. 16.
 Unified Traction Plan for Chicago will Pull Out Sides of Elevated Loop.* W. B. Parsons, Robert Ridgway and B. J. Arnold. (From Report to Chicago Traction and Subway Commission.) (14) Dec. 23.
 Cutting Costs in Storage Yards.* R. C. Cram. (17) Dec. 23.
 New Center Cut Method Avoids Vertical Side Face in Bad Rock on New York Subway Work. (14) Dec. 23.
 Street-Railway Track Without Spikes or Bolts.* (13) Dec. 28.
 Interesting Applications of Circuit Breakers for the New York Municipal Railway.* (17) Dec. 30.
 Regulating \$5 313 000 000 of Utilities: This Description of the Machinery of Present-Day Regulation is Based on the Intricate but Smoothly Running Organization of the Public Service Commission for the Second District of New York.* (17) Dec. 30.
 Electric Railway Drawbridge Safeguarding. Frederick W. Johnson. (17) Dec. 30.
 Convenient Inspection Record System.* A. Blanchard. (17) Dec. 30.
 Handling Traffic at the National Dairy Show: Methods Employed by the Springfield (Mass.) Street Railway.* (17) Dec. 30.
 "South Station Under" of Boston Rapid-Transit System Has Ample Traffic Facilities.* William W. Lewis. (14) Dec. 30.

Roads and Pavements

- Future of Granite, Macadam and Concrete Roads. H. Percy Boulnois. (104) Nov. 17.
 Main Road Maintenance in Kent. H. T. Chapman. (From Annual Report of County Surveyor.) (104) Nov. 17.

* Illustrated.

Roads and Pavements—(Continued).

- Maintenance of Macadam Roads with Bituminous Binders.* Theron M. Ripley. (13) Nov. 30.
- Bank Street, Ottawa, Subway Pavement.* L. McLaren Hunter. (96) Nov. 30.
- Organization, Scope of Work, Methods of Operation and Control of the Philadelphia Bureau of Highways and Street Cleaning.* William C. Greamy. (2) Dec. 6.
- Convict Labor on Highway Construction in Arizona. Lamar Cobb. (From Report of State Engineer.) (86) Dec. 6.
- Convict Labor on Road Construction in Maine. (From Report to State Highway Commission.) (86) Dec. 6.
- Detailed Cost of Gravel Road Maintenance. (From Report of State Highway Commission of Maine.) (86) Dec. 6.
- Method and Cost of Grouting Brick Pavements. (86) Dec. 6.
- Motor Truck Traffic on New York Highways. (86) Dec. 6.
- Detailed Cost of Bituminous Surface Treatment Work at Philadelphia.* (86) Dec. 6.
- Methods and Cost of Resurfacing an Old Macadam Road With Rock Asphalt.* (86) Dec. 6.
- Method and Cost of Filling Joints in Bituminous Surfaced Concrete Pavements of San Bernardino County, California.* (86) Dec. 6.
- Comparative Analysis of Economic Effect of Road Improvements in Eight Counties. J. E. Pennybacker and O. Eldridge. (From *Bulletin*, U. S. Department of Agriculture.) (86) Dec. 6.
- Method of Grade Calculations for Street Intersections.* R. G. McMullen. (From Report to Department of Public Works of Portland, Ore.) (86) Dec. 6.
- Small Hand Oiler for Maintenance Work.* (86) Dec. 6.
- Clinker Mephalt Roads and Disposal of Refuse Destructor Clinker at Abertillery. Lionel D. Lewis. (104) Dec. 8.
- Avers Chicago Can Improve Its Paving Methods. Ira O. Baker. (From Report to City Council.) (14) Dec. 9.
- Build Monolithic Brick Road on One-Inch Base.* (14) Dec. 9.
- Financing of County Road Systems. (From Annual Report of Department of Public Highways of Ontario.) (96) Dec. 14.
- Vibrating Concrete Makes Dense Paving Mixture.* (13) Dec. 14.
- Bank Street (Ottawa) Bridge Repaving. L. McLaren Hunter. (96) Dec. 14.
- Coal Tar Road Binder.* (83) Dec. 15.
- Changes Suggested in Traffic-Census Forms: Standards of Am. Soc. of Municipal Improvements Held to be Unsuitable for City Work.* Daniel B. Goodsell. (14) Dec. 16.
- How to Maintain Concrete Roads and Streets. (From Portland Cement Assoc.) (46) Dec. 16.
- Equipment Efficiency. Fred R. Kanenglliser. (Paper read before Institute of Paving Brick Manufacturers.) (76) Dec. 19.
- Slides in a Deep Street Cut. (13) Dec. 21.
- Road Drainage: the Importance of Proper Foundations. W. F. Childs, Jr. (From *Cornell Civil Engineer*.) (19) Dec. 23.
- Road Resistance Tested by Motor-Truck Runs.* A. E. Kennelly and O. R. Schurig. (From Mass. Institute of Technology *Bulletin* of Research Division.) (14) Dec. 23; (86) Dec. 20.
- Cost Records of Monolithic Brick Pavements.* William Robert Paige. (13) Dec. 28.
- Flushing Streets from Trolley Cars at Worcester, Mass.* (13) Dec. 28; (86) Dec. 6.
- Brick Pavement on Two-Inch Mortar Base Laid for \$1.45½ Per Square Yard.* P. E. Green. (14) Dec. 30.
- Estimates Expenditure on Lincoln Highway for 1916. (14) Dec. 30.
- Improvements Made in Signposts for Roads.* (4) Dec. 30.

Sanitation.

- Sewage Disposal at Leeds: Treatment during 1915-16: Analyses and Working Costs. George A. Hart. (From Report of Leeds Sewerage Committee.) (104) Nov. 17.
- Heating and Ventilating Dwelling Houses. C. T. Alfred Hanssen. (Paper read before Soc. of Engrs.) (104) Nov. 17.
- Is the Recovery of Nitrogen in Sewage Sludge Practicable? William R. Copeland. (From paper read before Am. Chemical Soc.) (104) Nov. 24.
- Difficulties in Utilizing By-Products of Sewage Sludge. George W. Fuller. (104) Nov. 24.
- Imhoff Tanks and Sprinkling Filters, Cleburne, Tex.* R. E. McDonnell. (13) Nov. 30.
- First Tile Sewers in St. Louis Compared to Brick.* Ben Moreell. (13) Nov. 30.
- Chicago Sewage Treatment and Dilution. (From Report to Sanitary District of Chicago.) (13) Nov. 30.
- Mt. Kisco Sewage Disposal Plant.* T. D. L. Coffin and F. E. Hale. (59) Dec.

* Illustrated.

Sanitation—(Continued).

- Tests for *Bacillus Coli* as an Indicator of Water. C.-E. A. Winslow. (59) Dec.
 Utilization of Ashbin and Other Refuse: Cheap Fuel Briquettes. Herbert G. Coales.
 (104) Dec. 1.
 Street Cleaning with Vacuum Cleaners at St. Louis, Mo. (86) Dec. 6
 Cost Data on Street Cleaning in Philadelphia, Pa. William H. Connell. (From
 Report to Bureau of Highways and Street Cleaning.) (86) Dec. 6.
 Activated-Sludge Results at Cleveland Reviewed.* R. Winthrop Pratt and George
 B. Gascoigne. (13) Serial beginning Dec. 7.
 Plumbing Equipment in Chicago Apartments.* (101) Dec. 8.
 Work of the County Sanitary Engineer. L. A. Boulay. (From paper read before
 Ohio Health Officers Conference.) (86) Dec. 13.
 Sewage Disposal Methods of 16 Cities. T. D. Allin and R. V. Orblson. (From
 Report to Public Works Department.) (86) Dec. 13.
 Activated Sludge Process. (From Annual Report of Manchester (England) Rivers
 Committee.) (96) Dec. 14.
 Detroit Sewer Construction Severely Criticized. (Extracts from Report to Detroit
 Department of Public Works.) (13) Dec. 14.
 Wayne Sewage-Disposal Works After Nine Years' Use. G. Everett Hill. (13)
 Dec. 21.
 Ventilating a Babbitt Casting Shop.* (101) Dec. 22.
 Disinfecting Sewage of Vessels and Railway Cars.* (101) Dec. 22.
 An Experiment in Househeating by Electricity.* Frederick A. Osborn. (27)
 Dec. 23.
 Binghamton Builds Interceptor with Four River Crossings.* A. L. La Roche.
 (13) Dec. 28.
 Intercepting Traps in House Drains. Harry Y. Carson. (From Report of Research
 Committee, American Society of Sanitary Engineering.) (101) Dec. 29.

Structural.

- Preservation of Iron and Steel by Means of Passivifying Factors.* Thos. G.
 Thompson. (71a) Vol. 7.
 Effects of Straining Structural Steel and Wrought Iron.* Henry S. Prichard, M.
 Am. Soc. C. E. (54) Vol. 80, 1916.
 Failure and Righting of a Million-Bushel Grain Elevator.* Alexander Allaire, M.
 Am. Soc. C. E. (54) Vol. 80, 1916.
 Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of
 Which Rests on Either Rigid or Yielding Supports.* A. C. Janni, M. Am. Soc.
 C. E. (54) Vol. 80, 1916.
 Important Piling Timbers of Australia. A. K. Armstrong. (11) Nov. 17.
 Fire Prevention and Protection. F. H. Wentworth. (From paper read before Am.
 Foundrymen's Assoc.) (22) Nov. 17.
 Torsion of Solid and Hollow Prisms and Cylinders.* Cyril Batho. (11) Serial
 beginning Nov. 24.
 Concrete Floor Falls After Early Removal of Forms.* (13) Nov. 30.
 Modern Manufacturing of Portland Cement.* George P. Dieckmann. (67) Dec.
 Large Products Plant in Successful Operation in Chicago.* (67) Dec.
 Big Sand Conveying Proposition. (67) Dec.
 Slab Deflection and Subsidence of Column Supports in a Floor Test of International
 Hall, Chicago, Made September, 1913. Henry T. Eddy. (3) Dec.
 Sand and Gravel Deposits of the Niles Sand, Gravel and Rock Company.* (67)
 Dec.
 Effect of Sulphur in Rivet Steel.* J. S. Unger. (From paper read before Am.
 Boiler Manufacturers' Assoc.) (25) Dec.
 Stresses in Impact.* Armin Elmendorf. (3) Dec.
 Paint for Steel, and Iron Structures. (Abstract from *Quarterly Bulletin*.) (96)
 Dec. 7.
 Proposes Complete Specifications for the Structural Steel Work of Buildings.
 R. Fleming. (14) Dec. 9.
 Concrete Construction in Winter. (96) Dec. 14.
 Grading in the Cement, Coal and Cork Industries.* Edward S. Wiard. (105)
 Dec. 15.
 Figuring Sizes of Roof Leaders.* A. L. H. (101) Dec. 15.
 Reinforced-Gypsum Roof Decks a Modern Development in the Structural Field.*
 Virgil G. Marani. (14) Dec. 16.
 Special Trusses of Rolled Beams Used in Walls of Sun Ship-building Plant.* (14)
 Dec. 16.
 Testing Clay Properties.* A. F. Greaves-Walker. (76) Serial beginning Dec. 19.
 Handling Sand and Gravel at a Cost of 1.7 Ct. per Cubic Yard.* (86) Dec. 20.
 Electric Driven Cement Mill of Oregon Portland Cement Co.* D. C. Findlay. (13)
 Dec. 21.
 Altering the Columns in a 21-Story Skyscraper.* (13) Dec. 21.
 Concrete Building Balanced on Middle Line of Columns.* R. C. Hardman. (13)
 Dec. 21.

* Illustrated.

Structural—(Continued).

- Metal Shingles and Their Application.* J. P. H. (101) Serial beginning Dec. 22.
 The Correction of Echoes and Reverberation in the Auditorium at the University of Illinois. (From *Bulletin*, Eng. Experiment Station, University of Illinois.) (19) Dec. 23.
 Bid on Concrete Building \$67 000 Less than Steel.* (14) Dec. 23.
 Letters on Hydrated Lime Which Won Prizes: Cites Advantages of Material When Used in the Construction of Bridges and of a Water-Filtration Plant. (14) Dec. 23.
 Reinforced-Gypsum T-Beams for Roof Decks Cast at Site and Hoisted Into Place.* Wharton Clay. (14) Dec. 23.
 Recommended Specifications for Reinforced Concrete Design (Issued by Portland Cement Assoc.). (86) Dec. 27.
 New Type of Roof Construction.* (86) Dec. 27.
 Construction Features, Plant Layout, Methods and Costs of Constructing a Reinforced Concrete Warehouse at Los Angeles Harbor, Cal.* W. D. Jones. (86) Dec. 27.
 Potash Becomes a Valuable Cement-Mill By-product.* Arthur C. Hewitt. (13) Dec. 28.
 Bottom Driven Concrete Piles on Government Job. C. S. Howell. (13) Dec. 28.
 Group of Buildings Designed for Maximum Daylight and Transportation Facilities.* (14) Dec. 30.
 Water the Chief Factor in the Making of Good Concrete.* Nathan C. Johnson. (14) Dec. 30.
 Unique Concrete Blocks Built by Home-Made Traveler.* (14) Dec. 30.
 Reinforced-Concrete Garage Has Cantilever Floors.* (14) Dec. 30.
 Making Lime from Marble.* (46) Dec. 30.
 On Stresses in Transparent Materials as Revealed by Polarized Light. E. G. Coker. (From *Transactions of the Optical Soc.*) (19) Dec. 30.
 Aciers à Outils, Travaux de Chariotage et de Fraisage, Recherche de la Meilleure Utilisation des Aciers à Outils. P. Denis. (93) May.
 Ueber das Rosten der Eiseneinlagen im Eisenbeton. Bruno Zschokke. (107) June 10.
 Die Beboachtungs-Station des Kinderspitals Zürich.* Rich. v. Muralt. (107) June 10.
 Das Oberengadiner Kreisspital in Samaden.* K. Koller. (107) Dec. 2.
Topographical.
 Dominion Land Survey Monuments.* H. L. Seymour. (96) Nov. 30.
 Bubble-Reading Mirror Proves Source of Error in Leveling.* George Bevier, Jr. (13) Nov. 30.
 Tunnel Surveying by String Where Transit Failed.* A. L. Plimpton. (13) Dec. 14.
 Surveying for the Milwaukee Intercepting Sewers.* Darwin W. Townsend. (13) Dec. 28.
 Retracing an Old Survey to Settle Boundary Dispute.* (13) Dec. 28.
 How Charts Are Made.* E. Lester Jones. (From Report of United States Coast and Geodetic Survey to Department of Commerce.) (19) Dec. 30.

Water Supply.

- Flow of Water in Irrigation Channels.* George Henry Ellis, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Water Supply of the San Francisco-Oakland Metropolitan District.* H. T. Cory, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Automatic Volumeter.* E. G. Hopson, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Induced Currents of Fluids.* F. zur Nedden. (54) Vol. 80, 1916.
 Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing.* Joseph W. Ellms, M. Am. Soc. C. E., and John S. Gettrust. (54) Vol. 80, 1916.
 Action of Water Under Dams.* J. B. T. Colman, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Economical Top Width of Non-Overflow Dams.* William P. Creager, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Study of the Depth of Annual Evaporation from Lake Conchos, Mexico.* Edwin Durvea, Jr., M. Am. Soc. C. E., and H. L. Haehl, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Water Powers of Canada. L. O. Armstrong. (65) Nov. 17.
 Drainage Equipment for the Hudson River Syphon of the Catskill Aqueduct.* (12) Nov. 24.
 Steel Pipe Conduit at Loch Raven, Md. Ezra B. Whitman. (Abstract of article from *Cornell Civil Engineer.*) (96) Nov. 30.
 Repair of the Tres Cruces Dam, Cavite Province, P. I.* C. R. Bennett. (From *Quarterly Bulletin*, Bureau of Public Works, Philippine Islands.) (13) Nov. 30.
 Report on Filtration for Calgary.* George W. Craig. (From Report to City Council.) (96) Nov. 30.

Water Supply—(Continued).

- Velocity Coefficients for a Dredged Drainage Canal.* Paul V. Hodges. (13) Nov. 30.
 Booster Pumping Station for Water-Supply to a Suburb. (13) Nov. 30.
 Engineers Condemn Montreal's Municipal Power Plant.* (13) Nov. 30.
 Discussion of Private Fire Services. (59) Dec.
 Freezing of Water in Subaqueous Mains Laid in Salt Water and in Mains and Services Laid on Land. William W. Brush. (59) Dec.
 Experience with Leadite in Jointing Cement-Lined Water Pipe. W. H. Buck. (59) Dec.
 A Comparison of "Temporary Hardness" with Alkalinity in Natural Waters. A. M. Bushwell. (59) Dec.
 Some Problems of the State Water Laboratory. L. H. Van Buskirk. (59) Dec.
 Recovery of Spent Lime at the Columbus Water Softening and Purification Works.* Charles P. Hoover. (59) Dec.
 Woodstock Waterworks.* R. O. Wynne-Roberts. (59) Dec.
 A New Raw Water Supply for the City of McKeesport, Pa. E. C. Trax. (59) Dec.
 London Water. A. C. Houston. (From Report to Metropolitan Water Board.) (104) Dec. 1.
 Use and Waste of Water: Calcutta's High Consumption. G. B. William. (104) Dec. 1.
 Water Power's Present Status. (From Report of Water Power Development Assoc. of Washington, D. C.) (111) Dec. 2.
 Serious Settlement Destroys Part of New Filter Plant.* (13) Dec. 7.
 Irrigation Field Laboratory at Denver, Colo.* (13) Dec. 7.
 City River-Control Reservoir and Plans for Operation.* (13) Dec. 7.
 Water Hammer Problems Solved by the Use of Alignment Charts.* R. L. Hearn. (96) Dec. 7.
 Hypo-chlorite Sterilization of London Water. A. C. Houston. (Extract from Research Report to Metropolitan Water Board.) (104) Dec. 8.
 Build Concrete-Slab Cover for 19-Mile Ditch.* A. C. Francis. (14) Dec. 9.
 Will Divert 1 400 Additional Second-Feet at Niagara. (14) Dec. 9.
 Merger of California Hydroelectric Systems.* (27) Dec. 9.
 Settlers with Small Farms Most Successful on United States Reclamation Projects. Franklin K. Lane. (From Annual Report of Secretary of Interior.) (14) Dec. 9.
 Bids Asked Before Bonds Were Voted to Show That Estimate Represented Real Cost of Pipe Line.* H. A. Rands. (14) Dec. 9.
 Pumphouse Construction Under Severe Tidal Conditions.* Charles S. Boardman. (16) Dec. 9.
 New Reservoir to Be Built Inside Old One That Failed.* (14) Dec. 9.
 Reservoir Capacity Increased and Construction Cost of Dam Decreased by Hydraulic Sluicing.* (14) Dec. 9.
 Report on High Pressure Pumping at Boston Shows Lower Operating Costs for Gas Than for Electricity. Edward F. Murphy and Joseph A. Rourke. (From Report to Commissioner of Public Works.) (24) Dec. 11.
 Cost of Filter Plant Operation at Cincinnati, Ohio. J. W. Ellms. (From Annual Report to Water Works Department.) (86) Dec. 13.
 Results of a Pitometer Survey. J. Walter Ackerman. (From Annual Report of Water Board.) (86) Dec. 13.
 Labor Costs of Constructing an Underground Pumping Plant. H. B. Ferriss. (86) Dec. 13.
 Method of Reducing Seepage Losses in an Irrigation Canal Through Porous Shale. J. H. Miner. (From paper in the *Reclamation Record*.) (86) Dec. 13.
 Advantages of Large Wells for Irrigation and Methods of Driving 30 to 36-In. Wells. (From *Bulletin No. 141*, Am. Well Works, Aurora, Ill.) (86) Dec. 13.
 Plan for Raising the Height of Morena Dam.* (13) Dec. 14.
 How to Save the Horseshoe Fall at Niagara.* (13) Dec. 14.
 Saskatoon Waterworks: Supply and Distribution.* (From Annual Report to City Commissioner.) (96) Dec. 14.
 Laying Concrete in Freezing Weather, Troy Lock and Dam. D. A. Watt. (96) Dec. 14.
 Well-Unit Water-Supply at Aurora, Ill.* (13) Dec. 14.
 Tests of Corrugated Culverts.* George L. Fowler. (23) Dec. 15.
 The Cross Hill Covered Service Reservoir for the Birkenhead Waterworks.* W. J. E. Blinnie. (Paper read before Institution of Water Engrs.) (104) Dec. 15.
 The Rating of Waterworks. Charles Clifton. (Abstract of paper read before Institution of Water Engrs.) (104) Dec. 15.
 Difficult Construction for Intricate Design of Ripon Siphonic Spillway, California. (14) Dec. 16.
 Tunnel Survey Methods Used Driving Strawberry Tunnel.* (16) Dec. 16; (13) Dec. 7.
 Small Hydroelectric Plant Being Constructed in Cuba.* (27) Dec. 16.
 New Multiple-Arch Dams in the Sierra Nevadas.* (13) Dec. 21.
 Rectangular Wooden Flumes.* J. C. Stevens. (13) Dec. 21.

* Illustrated.

Water Supply—(Continued).

- Scotch Method of Cleaning Water Mains. (From *Water and Gas Review*.) (96) Dec. 21.
 Multiple Arch Dams on Rush Creek.* (111) Dec. 23.
 Surge Tank Problems Solved by New Methods.* A. G. Hillberg. (14) Dec. 23.
 Rainfall Data Interpreted by Laws of Probability.* Thorndike Saville. (13) Dec. 28.
 Tunneling in Firm Clay with Compressed Air.* (13) Dec. 28.
 New Ditch Excavated in Bank of Old One.* C. D. Conway. (14) Dec. 30.
 Higher Unit Stresses for Pipe and Computation of Water-Hammer Pressure Advocated. Barton M. Jones. (14) Dec. 30.
 Soft-Ground Tunnel Under Lake Union at Seattle Presents Many Difficulties.* (14) Dec. 30.
 Le Barrage-Réservoir d'Eléphant Butte (New Mexico, Etats-Unis).* P. Calfas. (33) Dec. 2.
 Talsperrenbau in Spanien.* O. Sommer. (107) Dec. 2.

Waterways.

- Design of a Drift Barrier Across White River, Near Auburn, Washington.* H. H. Wolff, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Preservation of Sandy Beaches in the Vicinity of New York City.* Elliott J. Dent, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Hydraulic Jump in Open Channel Flow at High Velocity.* Karl R. Kennison, Assoc. M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Pearl Harbor Dry Dock.* H. R. Stanford, M. Am. Soc. C. E. (54) Vol. 80, 1916.
 Plans, Specifications and Unit Prices for the Dock under Construction at North Market Street.* C. E. Smith. (115) Nov.
 Municipal River Terminal System for St. Louis.* S. W. Bowen. (From Report to Public Utilities Department.) (115) Nov.
 Tunnel for Marseilles Canal Largest in World.* (13) Nov. 30.
 New Type of Mattress Used for River-Bank Protection.* A. C. Everham. (13) Nov. 30.
 Unusual Slide of Canal Lining and Its Repair. (13) Nov. 30.
 Outlet Control of Elephant Butte Dam.* F. Teichman. (13) Nov. 30.
 Fire Prevention and the Protection of Wharves and Piers. (Abstract of Report read before the Railway Fire Protection Assoc.) (15) Dec. 8.
 Diversion-Weir-Canal Type Used for Pioneer Hydroelectric Development in Sandy Soil.* (14) Dec. 9.
 Barbed Wire Helps Build River Embankments.* (14) Dec. 9.
 Mill Creek Improvement Project, Erie, Pa.* (86) Dec. 13.
 Five Days on the Mississippi.* Frank C. Wight. (13) Dec. 14.
 Dredging Equipment for Any Contract Should be Chosen to Fit Exactly the Conditions Expected (Canals). Arthur M. Shaw. (14) Serial beginning Dec. 16.
 Inspection Methods on Government River and Harbor Work.* G. S. Verrill. (From paper read before Conn. Soc. of Civil Engrs.) (86) Dec. 20.
 Flood Control Will Make Waste Land Factory Sites. (From Report of City Plan Commission of St. Louis.) (14) Dec. 23.
 New Municipal Dock at St. Louis.* (13) Dec. 28.
 Les Ports français et la Guerre, Marseille.* Auguste Pawlowski. (33) Dec. 16.

* Illustrated.